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Electrical World

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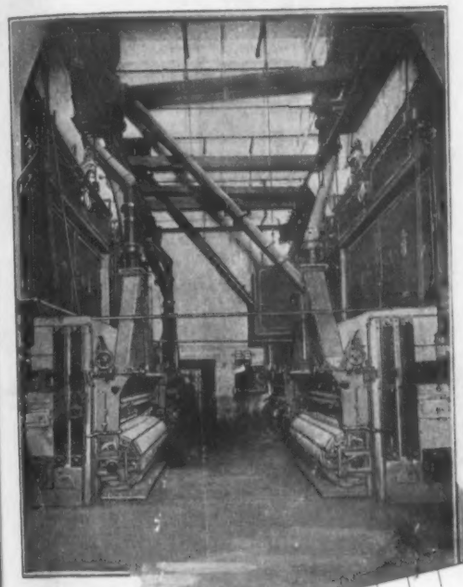
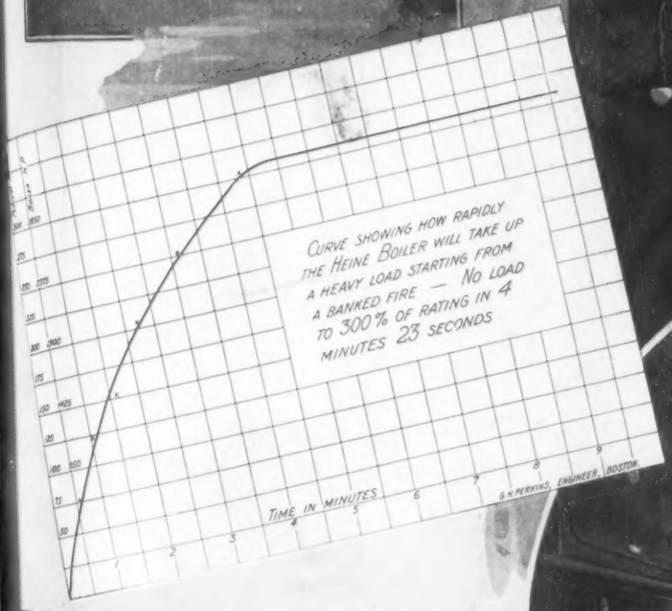
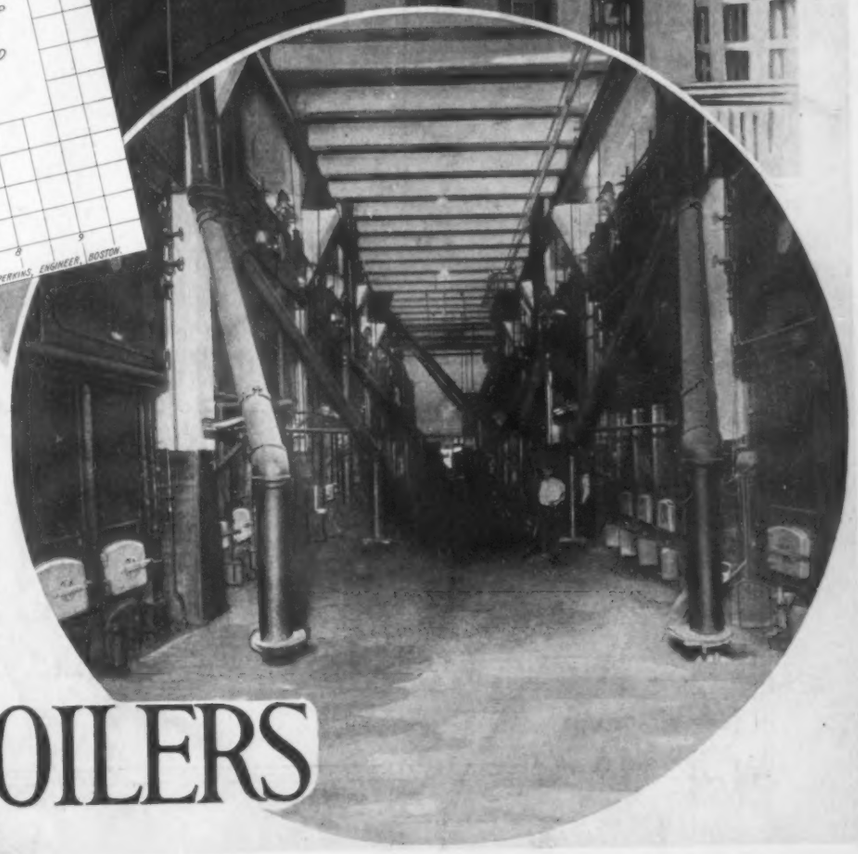


Grand Central Terminal Power Plant

New York City

8000 Hp. Heine Boilers installed


CURVE SHOWING HOW RAPIDLY THE HEINE BOILER WILL TAKE UP A HEAVY LOAD STARTING FROM A BANKED FIRE — NO LOAD TO 300% OF RATING IN 4 MINUTES 23 SECONDS
TIME IN MINUTES
G.H.PERKINS, ENGINEER, BOSTON



BIG INSTALLATIONS require Large Overload — Quick Steaming Capacity

The curve above gives an idea of how Heine boilers are meeting these exacting conditions. It was taken from a series of tests run on one of a battery of 950 hp. Heine boilers under severe conditions. Let us send complete details on Heine Large-Unit Boilers.

Heine Boiler Company, St. Louis, U. S. A.

HEINE LARGE UNIT BOILERS

YOU have asked for it and here it is! A direct current watthour meter with separate terminal chamber located at the bottom. It can be furnished in all standard sizes up to 50 amperes for both 2 and 3 wire circuits. It has successfully passed all Meter Code Tests and is not experimental in any degree. It is particularly adapted for use with Safety Boxes and several of the manufacturers of these devices are preparing trims. Prompt deliveries.

This meter was developed at the suggestion of the Meter Committee of the National Electric Light Association.

DUNCAN ELECTRIC MFG. CO.

Lafayette, Ind.

Electrical World

New York, Saturday, September 24, 1921

Tax Delinquency as a Suggestion to the Business Man

THE unusually large delinquency in the last income-tax payment is striking evidence that people in this country are tired of taxes that are hard to pay. Rich and poor are clamoring. Everybody is becoming more and more disgusted. What are we going to do about it—we in the electrical industry? For it affects our own prosperity, and we might as well stand to the facts right now.

No man thinks that he can live tax-free. We all know that we must support our government and continue paying for the war for many years. That is not the point. The trouble is that we are weary of assessments that interfere with our living and our business. We are sick of saving for the revenue collector and periodically paying out more cash than we can spare. We are simply tired of taxes that are *hard to pay*.

A few years of practical application have proved that the principle of the income tax is bad because it penalizes personal prosperity. It drives capital out of business into hoarding, hiding and tax-exempt investments. It discourages initiative and enterprise. It is unfair. Tax what a man spends, however, and you lay the burden equitably upon all according to their voluntary standards of living. As they spend they pay the tax and never know it. And what they save should not be taxed since in the banks or by investment it is loaned to industry to employ labor, develop resources and create wealth. When they spend it, then they pay. It is not only fair, but it does not hurt. And this is the purpose and the method of the sales tax idea.

This sales tax has been well proved in Canada, where for a year manufacturers and importers in all sales direct to the consumer have added 2 per cent for tax and paid it to their government. On sales to jobbers they have collected 1 per cent and the jobber has collected 1 per cent on his resales to the retailer. This is on all sales except exempt necessities of life. The tax has been reported and remitted monthly. Unnoticed by the man who paid, it brought in $50,000,000 last year. The same tax from our population would have meant $600,000,000. This year Canada has slightly increased the rate and cut the exempt list to further ease the income-tax demands that men are tired of.

The ELECTRICAL WORLD believes that American homes and American business need this kind of sensible relief from the exasperating burden of taxes that are hard to pay. Congress has laid the matter aside, but we should have the sales tax now, and we will have it when our business men demand it. Electrical men should keep on working for it.

John Foster Gilchrist

Advocate of a strong N. E. L. A. organization, leader in good-will activities and originator of the idea of state committees on public utility information now spreading over the country.

THROUGH a practical conception of the responsibility of the utility as a public servant John F. Gilchrist has done at least as much as if not more than any other individual in the utility field to promote public good will and understanding. Mr. Gilchrist, who has grown up in the electric light and power business in Chicago, rising from office boy to vice-president of the Commonwealth Edison Company, has shown a marked understanding and sympathy for the public point of view and is a stanch advocate of large corporations, or, as he once called them, "a collection of people working mutually in some business in order to carry out on a large scale and in a co-operative way an enterprise that no one man can carry out." He has for years spent much time in educating utility employees and the consuming public in the belief that if the people once get a right point of view harmonious relations will result. Nor has he confined his efforts in this direction to those regions in the Middle West served by the Insull properties. He has rather worked on the assumption that good relations in his particular section are in a measure influenced by right relations elsewhere. When president of the National Electric Light Association in 1911-12, the theme of most of his addresses was the need for a greater consciousness of the worth of the public utility corporation. And now, a few years later, he fosters the greatest single movement toward better public understanding, namely, the state committees on public utility information. Beginning with a committee which he got together to disseminate information about all public utilities in Illinois, the idea has spread until twenty-one states now have such committees and others are about to establish them.

It was the bright lights that attracted Mr. Gilchrist to the electric industry. He tells the story himself of how about thirty-six years ago, when a mere boy, he was a ticket seller and lecturer for a concern showing panoramic views of the siege of Paris and how the electric arc lamps used for display purposes around the show aroused his interest and started him on his electrical career. Born in Chicago on March 14, 1868, he was educated in the Chicago high schools and was graduated from the law department of Lake Forest University. He entered the services of the old Chicago Edison Company, predecessor of the present Commonwealth Edison Company, as office boy in 1887. From 1894 to 1896 he was assistant to the manager of the electricity sales department, and he was general contract agent from 1896 to 1906. He then became assistant to the president, holding that position until 1914, when he became vice-president in charge of purchasing, stores, transportation and statistical departments. At the present time Mr. Gilchrist is also president of the Federal Sign System (Electric), assistant to the president of the Public Service Company of Northern Illinois, vice-president of the Middle West Utilities Company and an officer or director in affiliated companies.

Mr. Gilchrist has engaged in a large way in association work, and besides having been president of the N. E. L. A., he was the last president of the old Electric Vehicle Association of America and was last week elected vice-president of the Association of Edison Illuminating Companies.

While a man of many characteristics, perhaps none is more apparent in his work than that of organization. As an officer of one of the best organized public service corporations in the country he has brought the organization idea into his association work. When president of the N. E. L. A. ten years ago he advocated and worked for a strong national body with sectional, state and company sections, all working harmoniously in a well-knit organization. This conception has now become an actuality, and the results that Mr. Gilchrist predicted are being reaped.

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A Plan to Make Convenience Outlets Better Known

MANY persons in the electrical industry do not know what an "electric convenience outlet" is. More than that, they show little appreciation of the tremendous possibilities in store for the industry through a determined effort to bring about a universal use of these individually small pieces of apparatus. When provided in adequate number in the baseboards, floors and walls of modern homes these inconspicuous invitations to use electric service are an effective means of bringing home frequently to the customer of moderate means as well as the more well-to-do the everyday service and convenience of electrical home appliances. That the value of the electric convenience outlet is appreciated by the consumers has been proved in California by the California Electrical Co-operative Campaign. Because they are convinced of the fundamental importance of this matter, the leaders of the electrical co-operative movement in that state are making an effort to enlist the active interest and support of the manufacturers in advertising "electric convenience outlets." The plan is to christen such apparatus with the double name "electric convenience" and to use this name in advertising and on the boxes in which the apparatus is sold. This is a worthy movement, and it is to be hoped that the active aid of the manufacturers, jobbers and dealers alike will be given it.

Put the Kilowatt-Hour in Its Place

HOW can rate schedules be rearranged to eliminate the prominence given to the kilowatt-hour and make the consumer think of the service he is purchasing rather than the measuring unit of that service? One suggestion is in the direction of leading the consumer to think in terms of hours' use of the apparatus he owns. This might be done by showing on the monthly bills the number of hours' use of a given piece of apparatus equivalent to a kilowatt-hour. A 40-watt lamp may be used twenty-five hours on an energy expenditure of 1 kw.-hr. A 1-hp. motor, allowing for the input as distinguished from the output in mechanical effort, will run one hour or a little more on 1 kw.-hr. of energy. A fact or two of this kind presented on the bills sent out each month and hammered on consistently in other forms of advertising would enable the consumer to think intelligently in terms of the service that he is paying for and would help to place the kilowatt-hour in its proper place as a measuring unit only. Martin J. Insull in his talks before the various association meetings during the past year emphasized the utility business as a sale of the use of a property investment. It should not be a difficult matter to present this fact in simple non-technical language. One central-station manager who has had considerable success in the handling of rural business has reduced his efforts to the placing of arguments in the language best known to the farmer—that of the cost of running his farm and maintaining his equipment. It requires a lot of thinking and the exercise of a great deal of ingenuity, but the effort is of the kind that brings the business man closer to his customer and, because of the broadening influence the study exercises, makes him a better business man.

This problem is one of the big ones in the broad problem of better public relations. Subordination of the purely technical and giving increasing prominence to methods of expression that do not require a technically educated man to understand are a necessary part of utility public relations work.

Comforting Effect of Large Coal Piles

NEXT spring the wage agreements with coal miners terminate in both the anthracite and bituminous fields, and there are intimations that a new wage scale 40 per cent higher than the present scale will be sought. The possibility of a railroad strike prior to that time hovers in the air. Both contests will be fought bitterly. Obviously every prudent manager will anticipate trouble by laying in an ample supply of fuel, first to tide him over a possible rail shutdown and then to insure his company against loss due to a coal strike. While the latter is yet a great way off, it is none too soon to prepare for it, and those who are not ready to face a railroad strike have cause to worry. Of course, neither strike may take place; but the only sure way of meeting trouble, impending or real, is to be prepared. Every electric light and power company's coal pile should therefore bulk large.

Commission Regulation of All Electrical Utilities Essential to Western Industries

ASPIRITED debate has arisen in California on the subject of the development of hydro-electric energy in the High Sierras and its transmission to southern California. The agriculturists in the great San Joaquin Valley want to be assured that there will always be available sufficient power to pump irrigation water for the eight million acres in that valley. They protest against power being taken from their vicinity and allocated to uses from which it can never be diverted. In particular, they are opposed to such power development by the city of Los Angeles since that city could not redistribute this power in the San Joaquin Valley. The ranchers claim that the supply of power

for agricultural uses should take precedence over the supply to industries. With this in mind they are demanding that their power supply be asssured and look for this assurance to the California Railroad Commission. The commission is empowered to compel the utilities under its regulation to supply power where and when it is needed. However, it has thus far no jurisdiction over politically owned utilities, and the ranchers in the San Joaquin Valley feel they are partly at the mercy of the city of Los Angeles. The most satisfactory solution of the difficulty is complete regulation of both politically owned and consumer owned utilities, a solution which must sooner or later be worked out if Western industry is to continue the marked development that the past few years has witnessed.

The Adjustment of Price to Meet Production Costs

DURING the progress of the war central-station companies, although hard pushed on account of the rising price of fuel and material of every kind, did the best they could to meet the interests of their customers and generally met rising costs by a coal clause or other temporary method of adjustment. On the whole, this expedient tided over the emergency fairly well; but now the question of fixed charges is very much to the front.

The central-station business is growing. It will grow faster in the future than it has in the past, and nearly every item of equipment is up in price with small prospect of reduction in the near future. Moreover, the rise in cost, let us say of transformers, is aggravated by the rising price of money. Companies that could borrow money at 5 per cent before the war now have to pay half as much again in raising a loan for necessary improvements and extensions. P. M. Lincoln points out in the current issue of the ELECTRICAL WORLD that while in steam plants the fixed charges are between 30 and 40 per cent of the total cost of production, in water-power plants they are likely to run from 80 to 90 per cent, thereby very forcibly emphasizing the importance of fair dealing with the fixed charges in transmission work. It cannot be denied that demand is a vital factor in the fixed-charge balance sheet of any consumer. We do not wholly agree with the theory that the amount of demand is the whole story, for in some instances the times at which that demand falls is of a great deal more consequence than its amount, and there are other factors of almost equal importance entering the situation. However, there is no question that the amount of demand deserves consideration. The question regarding the basis on which fixed charges of a growing plant should be computed is not to be answered quite so simply as here indicated. Speaking broadly, neither the pre-war cost nor the present cost is a fair basis for computation, because the present cost may affect a very small part of the equipment and the next decade may improve the cost situation very materially. We doubt now whether any commission would countenance charging a new customer on the somewhat exaggerated prices of the last year or two, while letting an old customer remain on a pre-war basis or charging a future one on some other basis. Probably the matter is best treated, like many other matters of a similar sort, by a general average of the costs.

The methods of determining the demand, which is commonly the biggest factor in the fixed-charge account against any particular customer, is somewhat important, and the special virtue of Mr. Lincoln's excellent article is that he points out a comparatively simple and straightforward way of getting at the demand on a kilovolt-ampere basis. As to the justice of making this the basis of demand we heartily concur. The method outlined by Mr. Lincoln of using the phase-shifting transformer with the standard wattmeter is from a practical standpoint very straightforward and simple. By this device the kilovolt-ampere can be directly measured to a very small error, while the power factor varies within wider limits than would generally be met in practice. From the standpoint of ordinary commonsense fairness the results are sufficiently satisfactory to suit any one not of litigious disposition.

If the precaution is taken of so adjusting matters that any small error committed by the instrument will be in the customer's favor, we do not see how any public service commission could in the least object to this scheme of operations. It is not quite so simple as would be the direct installation of a suitable kilovolt-ampere-hour meter, but in default of such an instrument it provides a substitute that ought to be acceptable. This whole matter of power factor, always troublesome, has assumed a more serious aspect on account of the enhanced present cost of providing the necessary equipment to meet the consumer's requirements, and it deserves therefore immediate attention, to which we hope Mr. Lincoln's paper will lead the way.

Significance of 1,000,000-Volt Tests

RECENT years have seen noteworthy advances in transformer construction, and designers have spoken with confidence concerning the possibilities for even further progress. The attainment of 1,000,000 volts, as announced in the ELECTRICAL WORLD last week, therefore occasions a feeling of satisfaction rather than of surprise. It is significant, however, that 1,000,000 volts was applied to conductors strung on insulators and that the phenomena of sparkover and corona formation were studied within this hitherto inaccessible region. While investigators of high-tension phenomena have anticipated the observations, it was nevertheless satisfying to find from these tests that the present accepted laws of corona and sparkover between spheres hold at the high voltage mentioned.

The necessity of a conductor four inches in diameter to prevent corona at 1,000,000 volts suggests that some ingenuity will have to be displayed if the "hoodoos" of the past—wind pressure and sleet load—are to be overcome on the 1,000,000-volt lines of the future. However, leading engineers have expressed the opinion that transmission distances greater than 200 miles will rarely suggest themselves. In fact, only recently 220 kw. has been seriously proposed as a standard figure for superpower systems and the longest transmission distances. The importance, then, of an available voltage four times as great must be found elsewhere than in the promise of longer distances of transmission. One obvious field of usefulness lies in the commercial testing of high-voltage insulation; but far more important is the opportunity offered for research and the acquirement through it of further knowledge as to the properties and behavior of all types of high-voltage equipment, leading to their ultimate improvement.

Further details of this important work will be awaited with interest. The announcement so far, while bearing the stamp of authority, is limited to the barest statements of fact. Doubtless more complete accounts in the language of the electrical engineer will soon be forthcoming.

The Biggest Single-Unit Generator Yet Constructed

A SINGLE generator with a rating of 60,000 kva. at 1,000 r.p.m. with provision for increase of speed by 50 per cent is indeed a Goliath. This is the rating of a generating unit now completed by the Siemens-Schuckert Company, which never before turned out a machine with much more than one-third this capacity. The structure, which was described in the ELECTRICAL WORLD for Sept. 10, is rather a peculiar one on account of the high speed, which brought the usual special difficulties in the way of ventilation owing to the necessary length of the laminations, in this instance 3 meters. In output this gigantic generator runs up to pretty nearly the high figure obtained with the composite turbo-generators. The total weight of the huge affair, including both rotor and stator, is about 250 metric tons.

The Allis-Chalmers Manufacturing Company is building some mammoth generators for the Mount Shasta hydro-electric plant, and in point of weight these, oddly enough, are almost exactly the equivalent of the German machine. Although running at one-quarter the speed, the rating is 35,000 kva., while the voltage is 11,000 against 7,000 in the German machine. On the whole, the American machine is as sensational in design as its foreign rival, considering speed and voltage.

It will be extremely interesting to watch the practical performance of these two types of machine, especially with reference to over-all efficiency. The question of how large a generator can be with real advantage under existing conditions as to frequency and rotative speed is constantly arising. Every new colossus gives additional useful information on this point, and we hope that detailed reports both from the Shasta plant and the Goldenberg plant, where the Siemens-Schuckert installation is being made, will be obtainable for the benefit of designing engineers.

Elimination of Confusion in Handling Bills of Material

ONE of the troublesome things encountered in a construction job is handling the material from the time it is ordered till its delivery on the job. Ordinarily the engineers who make the plans get out the bills of material, including enough information to enable the purchasing department to get quotations and finally place orders. It is necessary for the engineers to go through the process of looking up catalog numbers, page numbers and all the requisite information, but this is seldom recorded in such form that those who subsequently must handle the bills of material can do so without looking up at least a part of the data or going back to the engineers in order to procure the wanted information.

It is seldom that the purchasing force makes record of the data in complete form when they are looked up, and as a result there is more or less lost motion throughout the entire job in the handling of material purchases and accounting. A method of keeping the bills of material that will eliminate a large part if not all of this lost motion is described elsewhere in this issue by R. L. Kirk. The use of such time-saving methods as this means real efficiency in the handling of construction. It means not only more time devoted to work that accomplishes something, but also an increase in the efficiency of the routine worker caused by his release from the constant endeavor to avoid the mistakes to which individual peculiarities in designating and calling for wanted material render him liable. Mr. Kirk's plan puts all the information that must be looked up at the beginning in standard record form, eliminating any excuse for confusion.

Prepare Your Equipment for Better Times Coming

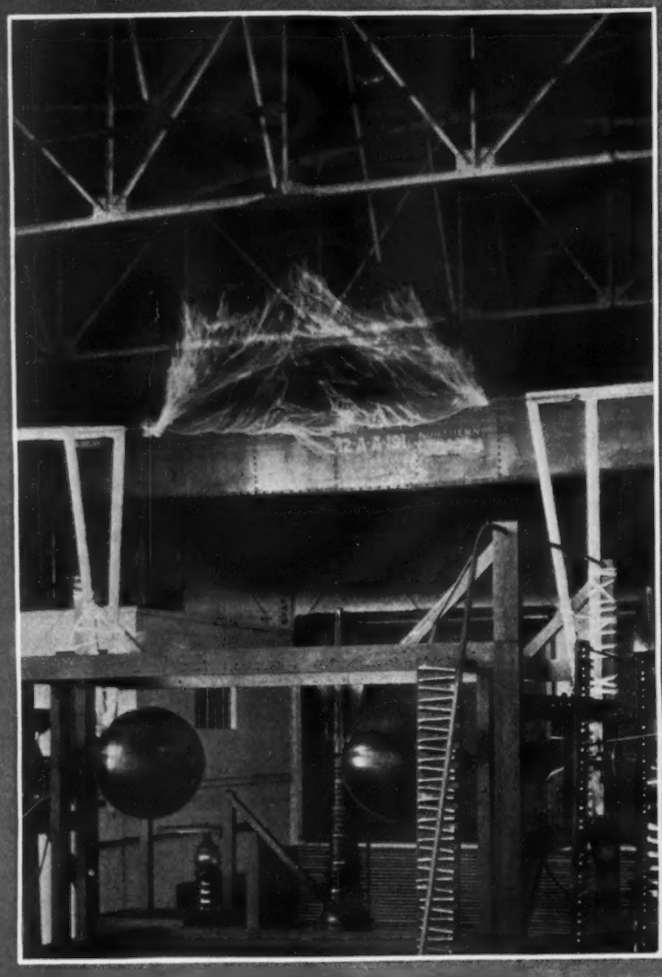
OWING to the lack of attention which electrical equipment has received in industrial plants, chemical works, mines and other places in the last few years, and particularly during the past twelve months, it is imperative that this equipment be thoroughly examined while opportunity permits, otherwise it may break down when most needed. This is particularly true in those plants where the equipment has been allowed to fall into disuse because of the industrial slump. One abnormal condition for which electrical equipment should be examined with especial care is absorbed moisture. If this be present, pains should be taken to drive it off without overheating the insulation. While the procedure is more or less familiar to most engineers, the article this week on page 616, by R. F. Stokes, may be helpful because of the co-existence at this time of an extensive need for overhauling equipment and an opportunity to do so.

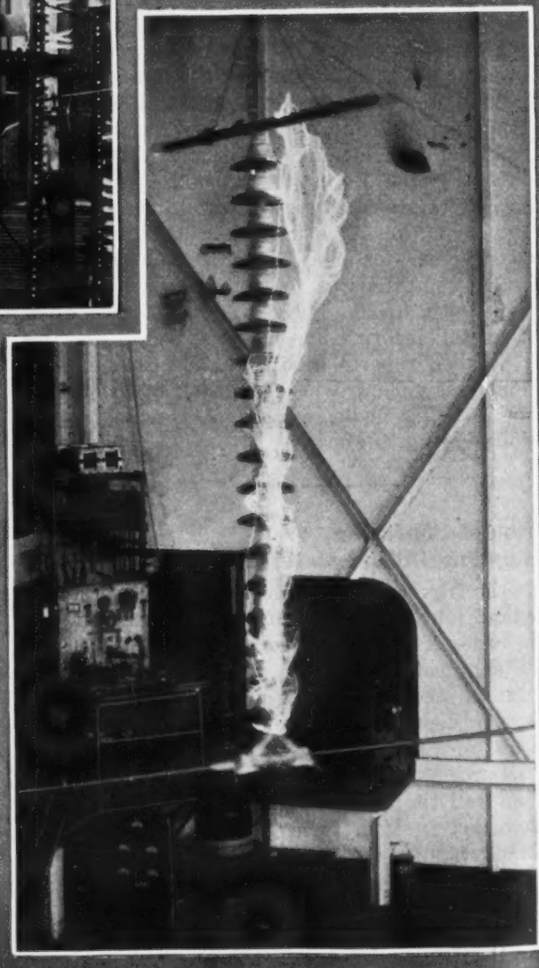
The commonest and perhaps the most satisfactory way of drying out a generator is to turn the machine over slowly by motor or otherwise, bringing up the voltage just enough to get a fairly stiff current with the winding short-circuited or connected through a water rheostat. Mr. Stokes notes one point which is sometimes forgotten—that it is not altogether safe to open the circuit even at low voltage before a machine is thoroughly dried out, since there may be inductive "kick" left in it quite sufficient to damage the windings, inasmuch as the current is likely to be quite as large as it normally is and may even represent an overload. It is always a safe play to cut down the current very greatly by the water rheostat before breaking it. Field coils are sometimes best dealt with by connection in multiple and supplying requisite current at abnormally low voltage. Transformers can generally be run short-circuited on very low voltage.

Induction motors present problems of their own according to the type of winding. If star-connected, one can get at the individual coils with comparative ease. A mesh winding is most easily dealt with by opening the mesh at some point and working on the windings in series.

As a last desperate resort a machine can be dried out from the outside, boxing it in and using incandescent lamps or heating coils as a source. The operation of thus drying out windings is so slow, however, that we are inclined to think the operator is justified in going to considerable length to get the proper source of current before he resorts to the employment of any external method.

Tests at 1,000,000 Volts Have Confirmed Corona and Sparkover Laws at Hitherto Uninvestigated Potentials





THE important feature of the 1,000,000-volt tests conducted at the Pittsfield works of the General Electric Company last week was not the voltage attained, because this potential has been developed experimentally before. The achievement was in applying this voltage to conductors hung on ordinary disk insulators and in studying the hitherto unexplored realm between 250,000 volts and 1,000,000 volts and determining the laws which govern corona and sparkover at these enormous potentials. As reported by F. W. Peek, Jr., in last week's issue, no discontinuity was observed in the corona and sparkover voltage curves established for lower potentials. While the occasion is remote, if it ever arises, when potentials of the magnitude investigated will be required for transmitting power, the observations are extremely valuable in establishing a concrete basis for conducting further research at high potentials.

Some of the equipment used in the tests is shown in the accompanying illustrations. Above in the foreground are the sphere and needle gaps, the latter discharging at 1,000,000 volts. Back of the gaps and below them may be seen the top of the step-up transformer. In the illustration at the right is a string of eighteen insulators flashing over at 900,000 volts. Close observation of the conductor and hardware will show corona discharge. To prevent this it was determined that a 4-in. conductor or its equivalent would have to be used. With a string of twenty-two disks no arc-over occurred even at 1,100,000 volts.

Rates Should Meet Higher Production Costs

Coal Clause Takes Care of Increased Operating Expenses, but Demand Charges Also Must Be Increased to Balance Higher Plant Costs—Simple Wattmeter Connection for Measuring Kilovolt-Ampere Demand

P. M. LINCOLN
Consulting Engineer Lincoln Electric Company

INCREASED operating costs of electric service companies can logically be reduced by increasing the energy rate at which power is sold. A convenient and reasonable method for accomplishing this result —and one much used in practice—is to incorporate a coal clause in the power contract, by which the energy rate varies either up or down depending upon the price of coal. The necessity of increasing the demand portion of power rates is not so immediately apparent as that for increasing the energy portion, but must eventually be recognized as soon as the increased cost of equipment has had time to make its effect felt. The demand portion of a power rate should be based on a measured quantity and not inferred from the installed equipment. Power factor should be recognized in the demand portion of a power rate. A method of applying such a rate recognizing power factor is suggested in the following discussion.

Virtually all rate makers in the past have recognized two major divisions in rates for electric service. One of these major divisions recognizes the operating costs and the other the fixed charges. It is generally recognized that operating costs are, as nearly as may be, proportional to the amount of energy delivered. Fuel, for instance, is the largest single item in these costs, and the amount of fuel required to serve a given consumer is nearly in proportion to the energy consumed. When the cost of fuel advances it is perfectly logical—as has been done—to advance the price of this major division of the rate. It is also perfectly logical to make the amount of this advance proportional—as nearly as may be—to the kilowatt-hours consumed. The "coal clause" accomplishes this object as equitably as possible. A slight arbitrary advance in the price per kilowatt-hour might be justified on account of the increase in the cost of operating labor and supplies, but these items are so small that they are easily covered by a slight variation in coal cost. It is unfortunate that some of our utility commissions have ruled against the coal clause. Such an adverse ruling shows that these commissions have been governed by considerations other than fundamental engineering considerations.

While this method serves very satisfactorily for taking care of the variation of those costs that vary with the amount of energy consumed, it does not and cannot recognize equitably those costs which are largely independent of the energy consumed but which vary with the amount of equipment which must be allocated to any individual user. This class of costs is provided for in the second major division into which the rate for service is usually divided, usually called the "demand" charge. It is to this major division of demand charges that the utility must look for compensation for the item of fixed charges in its costs. It is obvious that the equitable allocation of fixed charges among all consumers is not in proportion to the amount of energy used but to the amount of equipment that must be provided for any given consumer. In other words, load factor must be considered in any equitable allocation of costs among the consumers of power.

It is of interest to note the degree by which the item of fixed charges influences the cost of water power as compared with steam. In steam plants the item of fixed charges makes up between 30 and 40 per cent of the total cost of the power, while in water-power plants it constitutes from 80 to 90 per cent of the total. In steam plants, therefore, the energy portion of the rate is somewhat more important than the demand portion, while in water-power plants the importance of the demand portion of the rate overshadows the energy portion many times. In a water-power plant virtually the only thing that determines the cost of serving a given user is the value of the equipment that must be allocated to render him service.

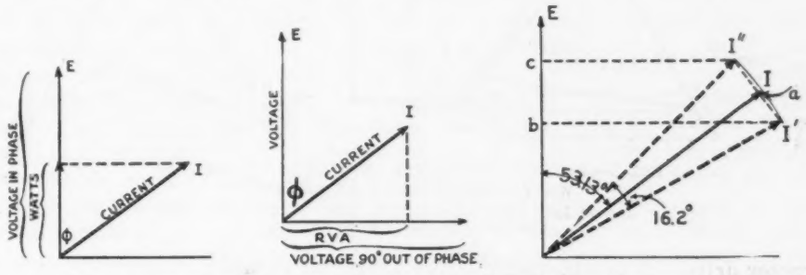


FIG. 1—WATTMETER CONNECTIONS FOR INDICATING WATTS (*A*), REACTIVE VOLT-AMPERES (*B*) AND VOLT-AMPERES (*C*)

DEMAND CHARGES MUST RISE FOLLOWING INCREASED COST OF PLANT

An examination of the rate increases during the last few years shows that while some changes have been made in the demand rates in some localities, such increases have not been general. Undoubtedly the reason for this is that in most cases the same plant is being used now as before the increase in plant cost went into effect, and that in general public utilities either have not been permitted to raise their demand rates or have not thought it wise to do so. There is a broad economic question involved in this matter. In brief, the question is this: Shall the public utility collect a demand rate based on the price paid for its plant before the war or shall it be on the basis of the price it would have to pay for that equipment today? Whichever way we answer that question today, we must recognize that the increase in equipment cost must eventually determine this question. The power

we use today is perhaps developed from equipment purchased five or more years ago, but the power we use some years hence must be developed from equipment purchased today. We may postpone this increase in demand rates, but we cannot deny it eventually.

CUSTOMER'S DEMAND SHOULD BE ACCURATELY MEASURED

At least one-third of the cost of power consists of fixed charges. It is this portion of the costs that is expected to be covered by the demand charge. It is highly important, therefore, that this part of the consumer's bill be accurately determined, and this is particularly true in water-power plants. In the past, owing to the absence of suitable instruments for the determination of demand, it has often—not to say usually—been the custom to estimate this part of a consumer's bill by basing it on the amount of equipment he had installed. It has been customary to aggregate the nameplate rating of all the motors that a consumer had and then base the demand charge on some arbitrary proportion of this aggregate. Some of the objections to and inconsistencies of this practice should be pointed out. In the first place, it puts a penalty on individual motor drive. It is admitted that the aggregate capacity of the individual motors required to drive a hundred separate machines is larger than that of a single motor to drive them all. On the other hand, the losses in the belting and shafting for individual drives will in general be much less than if all are driven by belting and shafting from a single motor. A system of charging for demand that puts a penalty on the individual motor drive is—to say the least—short-sighted.

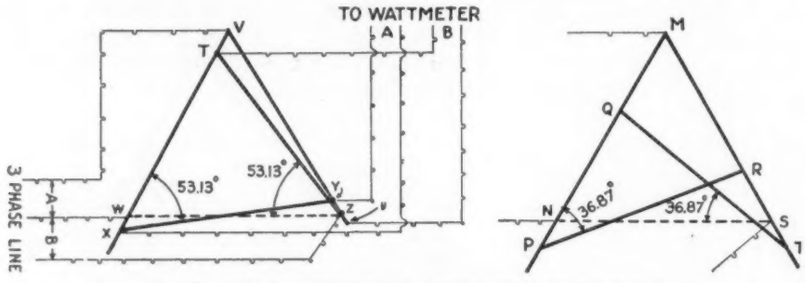


FIG. 2—PHASE SHIFTING TRANSFORMERS FOR MAKING WATTMETER RECORD VOLT-AMPERES
A—For use on load with 60 per cent power factor. B—For load with 80 per cent power factor.

A second vital objection to the method of estimating demand from horsepower ratings of the motors lies in the moot question of just what is meant by horsepower in a motor. The horsepower rating of a motor is necessarily tied up to the temperature at which that horsepower is developed. The market today provides standard lines of motors at 50 deg. rise, 40 deg. rise and 35 deg. rise. A 50-deg. motor is supposed never to carry more than its rating, while the lower temperature rise machines will carry 25 per cent overload for at least two hours and much larger overloads for shorter periods. If the practice of estimating demand rates from horsepower ratings is to continue, cognizance must be taken of the temperature rating of the motors used. And then there are some types of load where horsepower rating has no meaning, such as on elevators and similar apparatus. The man who can bring order out of that chaos and estimate an equitable demand rate based on nameplate ratings is wiser than most electrical engineers. After all, it is a consumer's actual use of a demand—it is the actual draft he makes on the system supplying him—that should determine his demand rate, and not his potential possibilities. Demand rate should be a *measured* and not an estimated or inferred quantity.

Another much needed modification in the application of demand rates is the necessity of recognizing power factor therein. The capacity of the transformers, transmission line, distribution circuits and generators to supply a given consumer is fixed by his kva. and not by his kw. The consumer that takes his demand at 100 per cent power factor should not pay the same rate as another that has a 50 per cent power factor, since the equipment needed in the former case is only one-half as great as that needed in the latter. The best cure for this evil is to recognize power factor in demand rate, so that the user of power who makes a proper application of motors to his service can earn a bonus in his power demand rate. Most contracts for power have a clause recognizing power factor, but up to the present this recognition has been largely theoretical only, the reason being that there is no commercial method of measuring kva. of demand. Almost all commercial methods of measuring either energy or demand recognize watts and watts only, and before we can recognize *by measurement* the kva. of demand there is not much use in incorporating a power-factor clause in power contracts.

SIMPLE SCHEME FOR MEASURING KVA. DEMAND

This opportunity is taken to outline and pass on a method of recognizing power factor that has already attracted considerable favorable attention. The method has many points of interest to those engineers who are charged with the responsibility of making rates for power service. It is not fundamentally new, but the writer has no knowledge of the exact modification herein suggested having been proposed before, nor of the suggested equipment having previously been offered.

The standard wattmeter of commerce, whether it be indicating, integrating or demand, is an instrument usually of high accuracy. The quantity measured is $IE \cos \phi$ where E is the voltage, I the current and ϕ the phase angle between E and I, as shown vectorially at A (Fig. 1). If now we should apply to the same wattmeter a voltage of the same value but shifted in phase by 90 electrical degrees, the quantity measured would be $EI \cos (\phi \pm 90°)$ equals $\mp EI \sin \phi$. This is shown diagrammatically at B (Fig. 1). The quantity $EI \sin \phi$ is termed "reactive volt-amperes."

If now the voltage applied to a standard wattmeter which has been shifted in phase by *any* arbitrary angle, θ, the instrument will then measure $EI \cos (\phi \pm \theta)$. The double sign for the angle is used advisedly since this sign will depend upon the direction of angular phase shift as well as the direction of phase rotation in the polyphase meter to which it is applied. If θ be chosen equal to ϕ and of the proper phase rotation, the quantity $(\phi - \theta)$ will become zero and the new quantity measured will be volt-amperes, volt-ampere-hours or volt-amperes of maximum demand, as the case may be. It is also true that there may be a considerable error in choosing the angle θ without a proportionate error in the volt-amperes measured.

This is shown at C (Fig. 1). Suppose a circuit has

a power factor of 60 per cent. This corresponds to a phase angle of 53.13 deg. between the current and voltage of the circuit shown. If a phase shift of 53.13 deg. is applied to the voltage of a wattmeter measuring this circuit, the quantity then measured will be volt-amperes. Also, there can be a shift of 8.1 deg. either way from the 53.13 deg. line assumed before the error of measurement becomes more than 1 per cent. The phase of the current may shift from *I'* to *I''* without causing an error greater than that of the small quantity *a*. The corresponding change in power factor is from *b* to *c*.

In the following table these limits of error are given for two definite degrees of phase shift. If a phase shift corresponding to the column headed "0" is applied to any wattmeter, the error of measurement remains within the limits of the other columns so long as the power factor remains within the limits indicated in these columns:

Error, per cent	5	2	1	0	1	2	5
Power factors	0.947	0.903	0.877	0.80	0.708	0.665	0.573
	0.820	0.747	0.707	0.60	0.481	0.429	0.320

For instance, if phase shift of 53.13 deg., corresponding to 60 per cent power factor, is applied to the voltage, the wattmeter will read volt-amperes with an error of less than 1 per cent as long as the power factor remains anywhere between 0.481 and 0.707. The error will then be less than 2 per cent for any power factor between 0.429 and 0.747 and less than 5 per cent for any power factor between 0.320 and 0.820. The range of power factor thus is very large for a comparatively small error. If, therefore, the power factor of a load is known in advance and is fairly uniform, it is possible to measure the volt-amperes with a reasonable degree of accuracy by means of any standard wattmeter and a phase-shifting voltage transformer. Unfortunately, the average power load does not possess a high degree of uniformity in its power factor as power factor varies over wide limits depending upon the load. However, the power factor that exists in a given plant at the time of its maximum demand can usually be determined with sufficient exactness to permit its maximum demand in volt-amperes to be determined by this method with an entirely satisfactory degree of accuracy.

Only Demand Portion of Bill Requires Correction

The way to correct bad power factor is to make it affect the demand portion of the user's bill, and this can be done by the method outlined. It should be particularly noted, however, that only the demand portion of the bill for power should be subject to correction for power factor and not the energy portion. There is no defense for increasing the energy portion of the bill on account of bad power factor.

Another thing that might be noted is that in applying the foregoing method any error in assuming the power factor of maximum demand results in a reduction of the demand rather than an increase. The final result therefore is a smaller bill for service than where the true volt-amperes of demand are used as a basis for the bill. This is the "safe" direction for an error, if any is to be made—the user cannot attack the method on the ground of any possible over-registration of his demand.

The practical man will ask: How can the methods outlined be applied in actual practice? For three-phase circuits it is possible to obtain phase shifts of 30 deg., 60 deg or 90 deg. by proper manipulation of the line voltage connections, provided that the neutral connection is available. On a two-phase circuit only a 90-deg. shift is available. To obtain other degrees of phase shift it is necessary to use some form of phase-shifting transformer. Such a transformer is not a difficult thing to build, and a few words concerning its possibilities may be in order.

Practical Methods of Metering Power Factor

The internal connections of a phase-shifting transformer to give phase shifts corresponding to 60 per cent power factor and 80 per cent power factor are shown diagrammatically in Fig. 2 (A and B). These transformers are for application to any standard three-phase circuit. For a two-phase circuit the connections must be modified. Referring to A (Fig. 2), the three-phase line circuit is connected to *WVZ*, *WV* being one transformer and *VZ* another. Taps are then made on the windings so that the voltage *XY* is shifted 53.13 deg. from *VW* and is of the same value as *VW*. The other phase element of the wattmeter voltage is given a similar phase shift as indicated. Diagram B indicates the method of obtaining the phase shift corresponding to 80 per cent power factor. The whole basis of the method is the existence of a fixed 60-deg. phase relation between transformers *XV* and *VZ*. So long as this phase angle remains at 60 deg. the results are as indicated and are independent of load unbalance. If the phase angle departs from 60 deg., the results will be somewhat in error, but even then the error is not large. For each degree of departure from 60 deg. between the two transformers the resulting error is approximately one-half of 1 per cent, being plus for phase angles greater than 60 deg. and minus for less than 60 deg. In any commercial three-phase system the departure from the 60-deg. angle between phases is not great enough to prevent the application of the method.

By the use of such a phase-shifting transformer, therefore, and any standard demand wattmeter it is possible to measure kva. of demand within a 2 per cent error at any power factor between 43 per cent and 90 per cent. This range will cover virtually all cases arising in usual power service.

One transformer made for this purpose is a small affair weighing about 8 lb. or 9 lb. (3.6 kg. or 4 kg.) and is applicable to any standard wattmeter. Tests carefully made have shown that the sample transformers are entirely accurate both in the matter of the angle of phase shift and regarding the value of the derived voltage obtained.

Direct Current Recommended for Dutch Electrification

THE commission appointed in January, 1920, to study the desirability of electrification of all railways in Holland has prepared a report which, it is understood, not only favors such a scheme but recommends the use of 1,500 volts direct current. It is also recommended that the electrification be made in connection with the proposed unification of electric light and power service throughout the country. There is no indication, however, that this work will be undertaken in the near future, according to Consul-General George E. Anderson, who sent this information.

Method of Keeping Bills of Material

System Primarily Intended for Electrical Construction Jobs, Although Modifications Can Be Readily Adapted to Any Kind of Engineering Work

By R. L. KIRK

DESPITE the careful investigation which accounting and cost records receive at the hands of engineers and executives, it is surprising that little or no attention is directed to the methods of keeping the bills of material which constitute such an important part of nearly all engineering. Some such scheme as outlined below will be found extremely effective. This method is intended primarily for electrical construction jobs, but modifications of this system can readily be adapted to almost any kind of engineering work.

At the beginning of a job a schedule for the classification of material should be made out in some such manner as follows: (a) Iron conduit, elbows and couplings; (b) condulets, boxes and fittings; (c) steel and iron work; (e) bolts, nuts and screws, etc. A separate bill of material sheet should be started for each class.

One of the chief advantages of the alphabetical system is the ease with which material may be subdivided under classified heads. This is made possible by the use of two or more letters for each item, the first indicating the class and the second (third and fourth if any) the individual letter. This groups all material of the same nature under one head, which not only reduces the time required by the designer in making up an individual bill of material for a drawing, but is of material assistance to the engineer and purchasing department in handling the orders.

Obviously, after the single letters of the alphabet have been exhausted, it will become necessary to repeat the letters, thus: x, y, z, aa, ab, ac, etc., which can be carried to three or four places if need be. In doing this, however, care should be taken not to have the item letters spell words, since such words as "cap," "nut," etc., might easily be taken to indicate a pipe cap or a nut for a bolt. This difficulty can be eliminated by omitting all vowels from the second letter of the series. Thus "bat would become "bbt," "ham" "hbm," "cow" "cbw," etc. The letters i, l, o and q should be entirely omitted, as when printed i and l may be mistaken for the numeral one, o for naught, and q for g.

For all jobs of any consequence a master bill of material is essential. This should show at all times the various items and quantity used on the job to date and should be so arranged that each item is completely described, in order to eliminate constant reference to catalogs to determine the exact physical nature of an item, entailing duplication and needless waste of time. All material used on the various drawings should first be entered in the master bill, from which all individual bills of material should be made. With this in mind the following method was developed, which seems to meet all the above requirements.

Two forms, shown in the illustrations, are required. These should be printed on standard 8-in. x 10½-in. letter-size sheets, with the horizontal lines parallel to the long dimension of the paper. Punched holes should be provided at the top of the sheet to allow binding in loose-leaf folders. It is well to have these forms printed on tracing cloth in order that prints may be made from time to time. Vellum can also be used to advantage, but this should have cloth reinforcing tabs at the holes to prevent tearing from the binder. The printing should be on the reverse side of the sheets to allow changing the entries without erasing the lines. All entries should be made in pencil until the job is finished, at which time they may be inked in. This allows changes from time to time.

In starting a master bill of material one or two sheets of Form I followed by as many Form II sheets as there are classes should be bound together in a separate binder. Many companies keep a "job book" for each job, in which are kept copies of requisitions, orders, various instructions and letters, together with the master bill. However, it is better to keep the master bill separate in order that it may be used independently of the job book. This practice will often avoid delay, and the time thus saved will many times pay for the cost of an additional binder.

The purpose and need of the various columns, together with the method of making entries, are as follows:

NATURE OF FORM II AND METHOD OF USING

The Heading.—This can be made to meet the individual requirements of the different companies, but should give the name and number of the job, the location, date and classification of material to be entered on the sheet.

Item.—Here are entered the item letters in alphabetical order, always two or more, the first the class letter, the others the individual letters. Thus, for conduit, bb, bc, bd, bf, etc. (omitting the vowels as the second letter).

Picture.—In large jobs the items under any class soon fill several pages, so that if only a description of the article is given, it is necessary to read and assimilate each entry in order to determine if a given article has already been assigned an item letter, which on large jobs requires considerable time. However, as the mind can grasp a picture of an article much quicker than it can a written description, it is advisable to sketch a simple picture of the item. It then becomes an easy matter to run down the column until the article is found. If in doubt as to the picture, reference should be made to the next column. In some cases, such as "conduit," "wire," etc., the picture is not needed. Only simple, easily made pictures should be used, as shown in the illustration, but all important information should be recorded. Thus for item gf, a ¾-in. conduit clamp, it is not sufficient to give only the size of the pipe, but the size of the bolt hole and the thickness of the base should be given, for if this information were omitted it would be necessary to refer to the catalog in

order to determine the size of bolt required each time the item was used. This column and the next should give all the essential details in order to eliminate the constant reference to catalogs.

Complete Description.—A complete description of an item should be entered here, not simply "outlet box," but "4-in. x 2-in. round outlet box, 1-in. K.O." Again, "condulet," even with the catalog number "XA22222," means very little to one unfamiliar with these fittings, yet "cross condulet, bottom outlet, ¾-in. all," tells the whole story.

Manufacturer's Number; Number of Catalog.—On the top line is entered the manufacturer's number as given in the catalog. On the second line the number or date of the catalog should be entered, inclosed in a circle to prevent any possibility of mistaking it for the manufacturer's number. This is advisable in order that there be no misunderstanding as to the article and also in order that it may be readily found in the proper catalog.

Page.—As the checker, engineer, purchasing department and often various designers will be required to refer to the catalog for each item in order to make the proper check, the page number on which the article is listed will be of material assistance. The time thus saved in a week will often pay for the work.

Where Used; Quantity.—An effective master bill should show the quantities of an item used on every drawing and identify the drawings on which they are used. Some companies provide a vertical column in which they put the drawing numbers on which the item is used followed by the quantity. This means that each item must be spaced many lines apart in order to allow for future entries. As this is only a guess at the beginning, it frequently means that too much or too little space is allowed. If the latter, it means rewriting the sheet with the proper spacing. The method used on Form II allows for twelve drawings on one line, and in case it is estimated that an item will be used on more than this number of drawings, one or two extra lines should be left open.

When the designer is ready to make up an individual bill of material for a drawing, he turns to Form I and enters thereon the title and number of the drawing. The corresponding key letter is used on Form II to represent this drawing, and is entered in the top space of this column, with the quantity used in the space below. The designer making the original entry may always change an item provided that it has not been used on another drawing in the meantime, which would be indicated by another key letter entered in the column. In this case the designer should erase his key letter and take out another item letter. In checking the individual bills of material against the master bill, it will be found much easier to carry the key letter in mind than the drawing number of four or five figures. Thus, if the drawing No. 36,483 has the key letter H, simply look for the item in question and note the quantity entered under H. This same letter H is used throughout the checking of that particular bill of material.

FORM I

MASTER B/M FOR Beacon Electric Co. STATION Hillside Plant J. NO. 2742 DATE 4/20/21

KEY LETTER	TITLE OF DRAWING	DWG. NO.	CHG. NO.	R. C. NO. DWG.	R. C. NO. B/M	DRAWN BY	REMARKS
A	Power Conduit Plan - 1st Floor	12345		36274	36278	J.P.	
B	Control Details - Pump Motors	12369		38295	37249	A.S.K	
C	Main Generator Leads - Details	12426	1	39247	38247	R.B.	Held for more details
D	Arrangement of H.T. Switchboard	12327		38245	39247	G.A.	

FORM II

MASTER B/M FOR Beacon Electric Co. STATION Hillside J. NO. 2742 b {Conduits, boxes fittings} DATE 4/20/21

ITEM	PICTURE	COMPLETE DESCRIPTION	MANUFACTURER	MFG. NO. NO. OF CAT.	PAGE	WHERE USED QUANTITY											ORDERED TOTAL
bb	1" ⊥ ¾" 1"	1"x1"x¾" Tee Condulet with blank Cover #300	Crouse Hinds Co	T32 (1000)	15	A 60	B 10	C 5	G 15	H 20	AA 10	AH 40					(200) 160
bc	¾" all	¾" Cross Condulet - Blank cover #200	C. H. Co.	XA 22222	279	A 10	B 10	X 20	AF 10								50
bd		4"x3½" Round outlet box - ½" K.O.	Appleton Elec Co.	R.C. 3½-½	129	K 150	M 100	AA 20									(250) 270
gf	¾"	¾" Conduit Clamp - 5/16" hole with 11/32" Base	V.V. Co.	2 (21)	22	A 10	B 5	K 20	M 25								60
mk		2 Gang, 1P+2P Switch plate - Brush brass, flush mounting	Bryant Perkins	O.P. (1921)	101	K 10	P 25	AA 30									55
mp		100-150 W. R.L.M. reflector - Keyless socket, for ½" conduit	Benjamin	5642 (17)	25	K 5	P 10	X 15	AL 30								60
ef	½"	½" Iron chandelier hook, with ⅜" hole	Wetmore Savage	12456 (240)		K 5	P 10	X 10	AL 10								35

FORMS THAT PERMIT CONSIDERABLE SAVING IN TIME WHEN KEEPING BILLS OF MATERIAL

Ordered; Total.—At the end of the job the total quantity is placed in the bottom space. If any material is ordered before the drawings are completed, the amount is entered in the top space inclosed in a circle. Thus it is possible to tell at a glance, as the job progresses, whether the amount ordered is sufficient, and the quantity which is left over at the end. The requisitions and orders for material should also be kept in the master bill folder, in order that they may be checked at any time.

Character of Form I and Method of Using

Heading.—Same as in Form II.

Key Letter.—These should be capital letters in order to differentiate from the item letters and should be used in a similar manner, except that no letters should be omitted.

Title and Drawing Number.—Explained under Form II.

Change Number.—This column records the change

number of the drawing (if any) on which the bill of material is drawn.

Record Card Number; Drawing; Bill of Materials.—Enter here the record card numbers on which time is charged when working on the drawing and its bill of material. This column can be made to meet the requirements of the individual company.

Drawn By.—The designer's initials should appear here in order that it shall be known to whom to turn for information relative to any item.

THE INDIVIDUAL BILL OF MATERIAL

The individual bill of material for each drawing should be made up from the master bill, but as these bills are not required to convey the complete information recorded in the master bill, they are of a much simpler nature. This bill of material need give only the item, description (not nearly so much detail as given in the master bill), the manufacturer, catalog number (manufacturer's number), quantity and remarks. Such columns as picture and page may be added, or some of the others omitted if desired. Some concerns prefer to place the bill of material on the drawing, while others issue it on a small separate sheet. Much can be said of both methods, both pro and con, although it is believed that the former has a slight advantage inasmuch as with this system only one print need be handled at a time, which is particularly desirable in the field. In any event, the master bill should be the key to the whole job, and except in rare cases all material should be ordered from this bill.

110-Kv. Transmission Line on Wood Poles

Narrow Right of Way Limited San Joaquin Power Company to Choice Between Wood and Steel Poles—Wood Cost Less Than Half Steel—Future Duplicate Line Will Insure Good Service—Cost of 72-Mile Line

By L. J. MOORE
Electrical Engineer San Joaquin Light & Power Corporation, Fresno, Cal.

IN DESIGNING the transmission line which is to carry the power from the San Joaquin Light & Power Corporation's Kerckhoff power house into the San Joaquin Valley one of the most important considerations was that of right-of-way. The line must of necessity be constructed for the greater part of its length through the most highly cultivated part of the valley. Private rights-of-way then would naturally have cost a large sum of money, both on account of the high value of the land and on account of the large acreage being owned by foreign-born citizens, many of whom practically refused any concession. The only alternative left was to build along public highways, which meant structures with very narrow bases, or, in other words, steel or wood poles.

A cost comparison between wood and steel pole lines showed that, for conditions under which the line was to be built and for a line voltage of 110 kv., the former would cost $69.50 per mile, against $148.60 for steel. Furthermore, with sufficiently heavy poles ample mechanical strength could be provided. Although in the matter of service wooden poles are not equal to steel, still the former has the advantage economically, and a duplicate line which will be required in the future will permit construction or maintenance changes with substantially no interruption to service, irrespective of the choice of pole. For this line 60-ft. (18-m.) wooden poles spaced 587 ft. (180 m.) were chosen to support 266,800-circ.mil stranded aluminum conductors with wishbone cross-arm construction.

The construction of a high-tension power line on poles immediately raised the problem of clearances between conductors. Ten feet (3 m.) clearance was considered quite feasible, but any more than that was considered rather dangerous on account of the fact that it would make the poles topheavy and would further hang the conductors too great a distance into the private property along the highway. The matter of clearance in such construction then worked out toward a medium high voltage line.

The location of substations and sources of power along the line also favored the more moderate voltage. From the accompanying map it will be seen that the company had already in operation a large ring system of 66,000-volt lines, approximately covering the San Joaquin Valley. It will be noted further that a line running practically due south from the Kerckhoff power house would cut across this ring system, dividing it very closely in half and permitting step-downs to 66 kv. at very advantageous points. A substation on the line

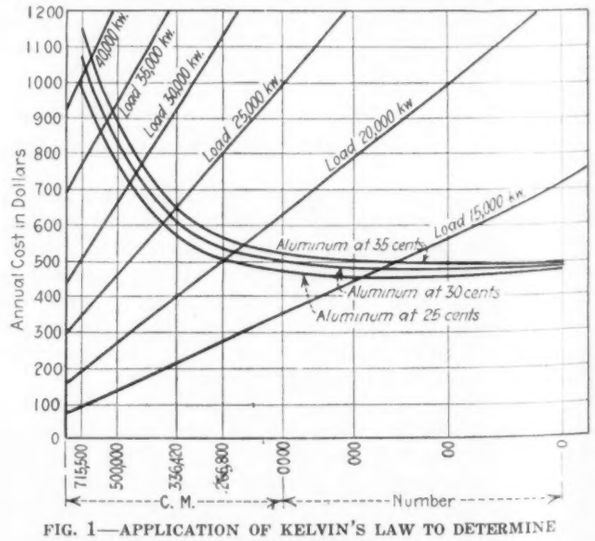


FIG. 1—APPLICATION OF KELVIN'S LAW TO DETERMINE ECONOMIC CONDUCTOR

Conditions assumed: 100 per cent load factor, power factor 85 per cent, lag. Cost of energy loss $0.00525 per kw.-hr. Annual charges 9 per cent interest, 4 per cent depreciation, 2 per cent maintenance.

east of Fresno and provided with the necessary outgoing 66-kv. line to Fresno and Reedley would effectively serve Fresno, the largest city in the valley, as well as the heavy irrigating load thereabouts. Another step down at Corcoran would carry the Coalinga oil

fields and the 66-kv. line to the coast. Another step-down station at McKittrick would adequately care for the oil field loads in that district. Stations at these locations would allow the old ring system to be operated in sections, so that in no case would the economical transmission distance for 66 kv. be exceeded and the new line would operate as a high-tension bus for the system, provision being made for incoming lines from the company's Kings River plants to connect at the substation east of Fresno. To take care of the north district around Merced an extension of the high-voltage bus is contemplated to extend west from the Kerckhoff plant and reach as near the center of distribution as practical, there stepping down, as in the other cases, to 66 kv. and feeding into the old network of lines of that voltage. Power from the Bakersfield steam plant would enter the high-tension line through the station at McKittrick, thus providing at least three points at which power would be fed into the line, with more than that many points where power would be distributed from the line, and in no case would the actual straightaway distance of transmission greatly exceed 70 miles (110 km.), with the steam plant operating. The short distance of transmission thus obtained was another reason for adopting a voltage only moderately high.

The altitude on the line is practically sea level; the highest point reached from the plant south is about 1,200 ft. (360 m.), and that for a very short distance. Therefore, the best possible corona conditions existed. A study of all conditions showed that by using stranded aluminum conductors a cross-section could be obtained which would be safe from corona and at the same time have the economical carrying capacity for the estimated load of the plant. This was obtained by figuring the plant at 30,000 kw. maximum with a load factor of 70 per cent, using a line 135 miles (217 km.) long with a voltage of 110,000. From the discussion already given of the location of incoming feeds and distribution points it is evident that much more than 30,000 kw. can be handled over the line without exceeding the economical current density.

With 110,000 volts chosen as the transmission voltage, a line was designed using 266,800 circ.mil all-aluminum conductors on 60-ft. (18-m.) steel poles, spaced 587 ft. (180 m.) apart, or nine to the mile. A loading of 8.75 lb. of wind per square foot (0.6 kg. per sq.cm.) without any ice or snow was used in the calculations However, the question arose of using wood poles of the same length instead of steel, leaving the spans the same. With the same conductor and wind pressure it was found that a 60-ft. wood pole with a 9-in. (23-cm.) top and 15-in. (38-cm.) diameter at the ground line had a factor of safety of 3.10 against horizontal loads and of 10 as a column. When the fact is considered that the Weather Bureau records of Fresno for a period of over thirty years show a maximum of 4.5 lb. per sq.ft. (0.3 kg. per sq.cm.) of wind pressure, the factor of safety is then seen to be more nearly 6, which provides ample safety. As a matter of fact the poles as installed ran near to 20 in. (50 cm.) in diameter at the ground, so the line is safe enough from overturning if the setting is secure. All poles in straightaway work were set 8 ft. (2.4 m.) in the ground and all dead ends and corners were set 9 ft. (2.7 cm.) in the ground. As a check on the depth of setting, all poles were stamped with the company's initials at a distance of 10 ft. (3 m.) from the bottom. The distance of this mark out of the ground is a direct indication of the depth of setting.

As to the economy of wood poles as compared to the steel poles, the following figures are given:

The lowest priced satisfactory steel pole, set in place, would have cost, using July, 1920, prices, $148.60. This includes a concrete base. A creosoted wood pole installed would cost $69.50, showing a saving of $79.10

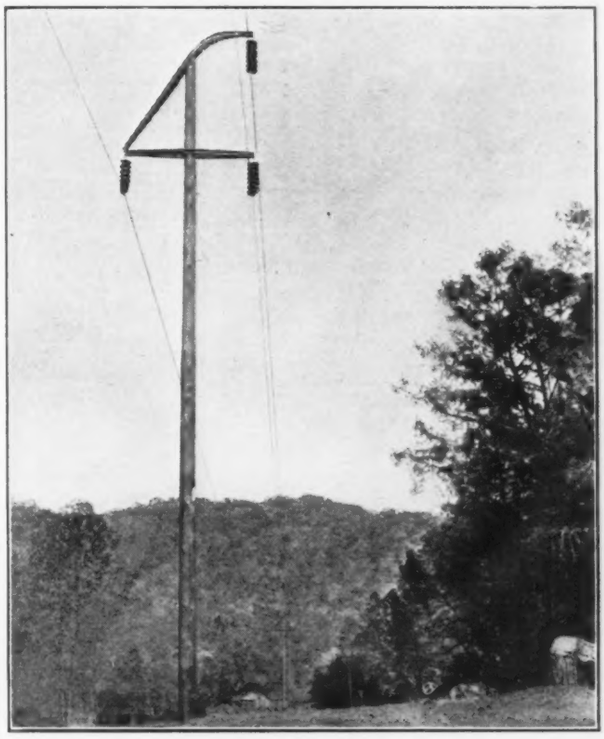


FIG. 2—INEXPENSIVE POLE LINE FOR 110,000-VOLT TRANSMISSION

This line conveys the output of the new Kerckhoff power development to the chief distributing points in the company's territory. The cedar poles are creosoted at the base.

per pole. This saving at 7 per cent interest compounded annually would amount to $306.12 at the end of twenty years. From the past experience of this company, and the opinions expressed by others, creosoted wood poles should show an average life of about twenty years. The interest alone on the money saved in this particular instance would amount to $227.02 in twenty years. This is 3.26 times the original cost of the wood pole installed, and it is thus seen that, even if poles practically trebled in cost in that time, it would still be possible to replace them with the interest on the money saved. At the time of construction the difference between wood and steel was even greater than that here indicated because wood poles at that time cost about 50 per cent of what they do today. The increase in the cost of steel, however, has not been so great.

The wood poles show greater mechanical strength when they are new than the steel pole which was considered. This is as it should be, since the rate of deterioration of wood is much greater than of steel. However, it shows an angle in the matter of choosing between the two materials which must not be overlooked. If the steel pole is to compete with the wood pole in price it must be designed with as small factors of safety as are at all safe for the individual installa-

tion in mind. Wood poles as a rule have larger factors of safety than necessary, especially where the conductors used are medium or small in size. It is often possible then to increase the size of conductor on an existing wood pole line without any danger whatever, whereas the same procedure on a steel pole line might not be allowable on account of exceeding the mechanical strength of the supporting members. In distribution work it is often necessary to hang a bank of transformers on a pole already installed in the line. If the pole is of wood the chances are that the procedure is entirely safe, but if it is a steel pole the loading must be carefully calculated and the strength of the pole compared with the result to see whether or not it is necessary to install a heavier pole. From a standpoint of service, it is no doubt true that a steel pole is the better. Its life is, of course, longer than that of a wood pole, and if this is twice as long it naturally holds that the interruptions to service for the changing of supports would be not over one-half the number in case of steel as of wood. However, in the particular instance herein described it is felt that the line as constructed is not large enough to handle the ultimate power transmission of the company and that at least a second one of the same capacity paralleling the first in route, as near as possible, must be constructed sooner or later. It is hoped to carry this line through the same substations as the first and to install balanced relay protection between the two in all sections. This will practically eliminate the interruptions from ordinary cases of trouble, and the fact that the line is constructed in duplicate will make it possible to change poles when necessary without interruption to service. This will be possible, too, in most of the sections when the new Kings River plants are brought into the line at Sanger and the new steam plant at Button Willow is constructed and the line looped through it, because the supply points will be so distributed along the line that sections can be taken out without separating a substation from one or the other sources of supply. It is possible, therefore, to maintain practically continuous service even though replacements will become necessary at some future time.

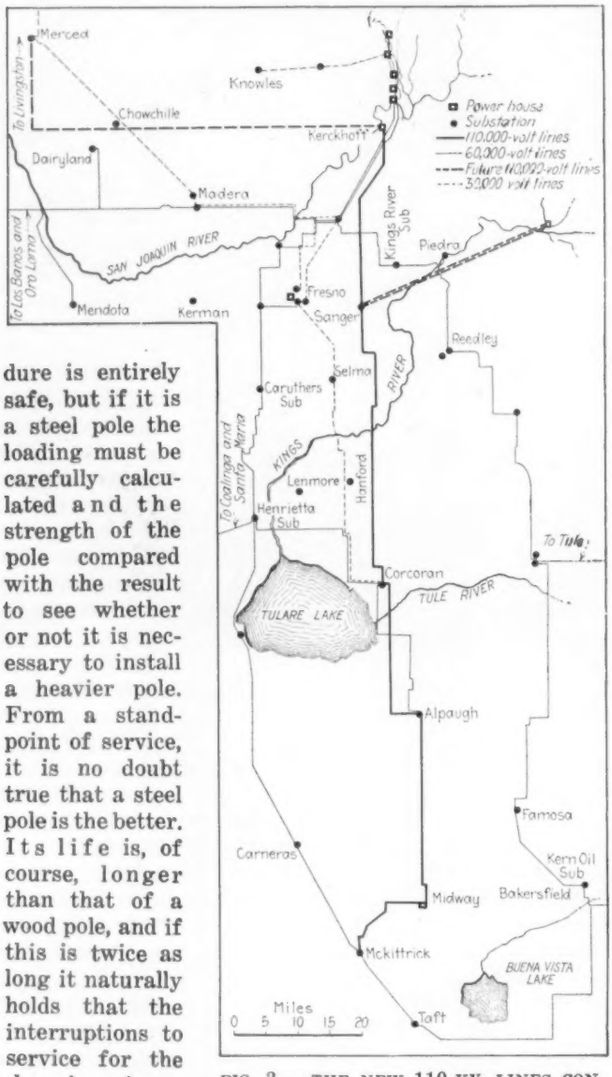


FIG. 3 — THE NEW 110-KV. LINES CONSTITUTE A BUS DIVIDING THE COMPANY'S 66-KV. TRANSMISSION RING IN HALF

In methods of making calculations of transmission line economics practically all writers agree on considering the conductor only, or rather that the price of conductor is the only variable in the equation. This may be true where tower lines on private rights-of-way are considered, but for transmission lines on single poles along public highways the cost of supports must also be variable. The 110,000-volt line described in this paper shows the lowest factor of safety against horizontal loads, and if the size of the conductor were increased and the length of spans left the same the line would be weak against horizontal loads. The supports must be spaced more closely then, or a different type must be used. Closer spacing means more insulators and the cost per mile of the line would show a much greater increase than that caused by the increased size of the conductor alone. "A" frames or "H" frames could be used and would keep the number of insulators down, but this would require at least one of the poles of the frame to be placed on private property, and thus the right-of-way question is immediately raised.

In making the economic calculations for this line, then, estimates were prepared on the costs of 1 mile of line using different sizes of aluminum conductors and varying the pole spacing in line with the discussion just given. Then the annual charges per mile of line were calculated on the basis of 9 per cent interest, 4 per cent depreciation and 2 per cent maintenance and the results are plotted against the annual cost of the power lost per mile of line at 5.25 mills per kw.-hr. Then, according to Kelvin's law, the line which shows an annual charge equal to the annual cost of power lost, or, in other words, the line indicated by the crossing of the curves of annual cost and the power lost for the given load, is the most economical line. It will be noted from the curve sheet here shown that with an aluminum conductor of 266,800 circ.mils cross-section, the economical load is 20,000 to 21,000 kw. at 100 per cent load factor and a power factor of 85 per cent lag, which is roughly the same as 30,000 kw. at a 70 per cent load factor. The critical disruptive corona voltage for that size conductor at sea level at a temperature of 120 deg. F. is approximately 130,000 at a spacing of 10 ft. between conductors. It was then chosen as being the most economical conductor for the load as well as being safe from corona at the operating voltage of 110 kv.

The accompanying table shows the segregated costs for 72 miles (116 km.) of the Kerckhoff line without the customary 15 per cent overhead. The standard spans are 587 ft. (180 m.), but in one or two instances spans up to 700 ft. (213 m.) were made on single poles by guying span poles all four ways. A few longer spans were made on "A" frames. Spans were shortened to 200 ft. (60 m.) over railroads. Poles were raised with a gin wagon in the valley country, but 15 miles (24 km.) of the line passes through foothill

TABLE—ITEMIZED COST OF 72-MILE, 110-KV. LINE IN SAN JOAQUIN VALLEY

	Survey:	
1	Cost of labor and expenses, including transportation, etc., making survey	$2,905.89
2	Right-of-way, cost of salaries and expense securing rights-of-way, easements, etc.	4,958.24
3	Clearing right-of-way, cost of labor and expense, including material used clearing right-of-way	13,384.02
4	Digging pole holes, cost of labor and expense, including material digging holes	11,708.19
5	Delivery of poles and cross-arms, cost of labor and expense	6,682.20
6	Delivery of wire and insulators, cost of labor and expense	3,509.55
7	Framing poles, cost of labor and expense, including framing material	66,925.29
8	Setting poles, cost of labor and expense setting poles, including material	29,056.76
9	Guying, cost of labor and expense, including material	5,426.22
10	Stringing wire, cost of labor and expense stringing wire, including material	86,309.27
11	Pulling up and tying in, cost of labor and expense	5,530.22
14	Office salaries and expense, including office supplies and stationery	3,633.69
15	Megging insulators, cost of salaries and expense	627.35
16	Casualty insurance	20.69
17	Interest during construction	11,605.84
18	Warehouse Sanger sub	309.88
	Total	$252,593.30

Total cost per mile, $3,508.24

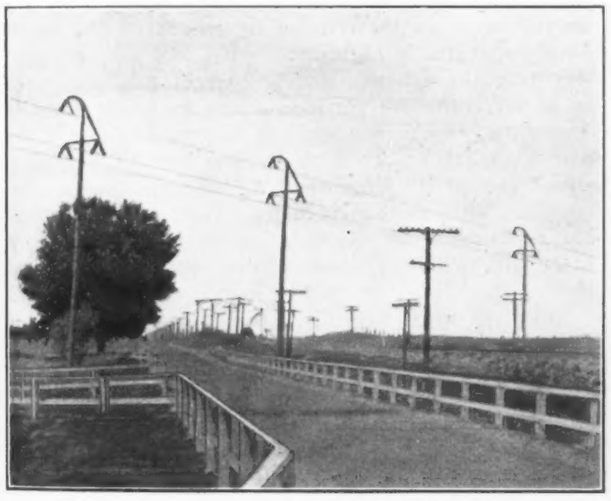
country and in that distance poles were raised by piking. Poles were framed on the ground and, where possible to use the gin wagon, the insulators were hung in place before raising. The holes were 8 ft. (2.4 m.) deep and dug by hand, bars and spoons being used. Considerable hardpan was encountered and in the foothill country many of the holes were in rock, making dynamite necessary. Linemen's wages ran $6.75 per day and groundmen's wages were $4.50 per day. Transpositions were installed making complete barrels about every 9 miles. These were made by simply reversing the arm on the transposition pole and thus rolling the line. The line is built almost entirely along public highways, thus the small cost of rights-of-way. Clearing of right-of-way includes cost of trimming and removing trees along highways. Many of these trees had to be purchased from property owners.

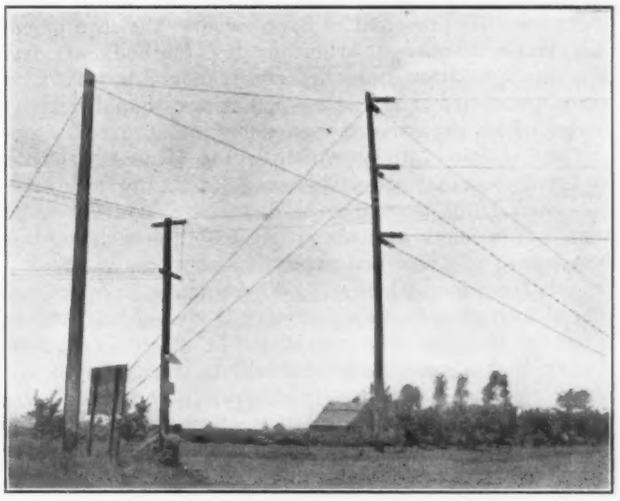
In all of the costs given in the table transportation of men, losses in the boarding houses, auto mileage, etc., are included.

Following are some actual labor unit costs:

Digging pole holes, per hole	$9.31
Setting poles, per pole	9.85
Framing poles, per pole	2.04
Guying	7.64

In the item of guying all labor of digging hole, burying slug and placing guy on the pole is included.





FIGS. 4 AND 5—RAILROAD CROSSINGS AND RIGHT-ANGLE TURNS ARE READILY PROVIDED FOR

Rhone Development Bill Passes French Parliament

AFTER two years of parliamentary debate the bill for the development of the River Rhone, the great southern artery of France, from the triple standpoint of electric supply, water traffic and irrigation, has at last become law, and it will now be possible, says a special correspondent of the New York *Times*, for a syndicate or syndicates to be formed to undertake simultaneously work of the three above categories and thereby, in addition to providing eventually a water transport line that will rival the Rhine in importance and to irrigating more than 600,000 acres of what is at present unsuitable land for agriculture, to provide the country with 900,000 kw. of cheap electric energy, this energy representing a saving in imports which amounts to at least 800,000,000 francs a year.

Concessions may now be granted for the above purpose for a period of seventy-five years over an area represented by at least one "section," whose limits are laid down in the law, but it is hoped that a single corporation will be found to undertake the whole "amenagement." The government is to wait three years in this aim, but should no company come forward by then smaller syndicates, which on account of the geographical conditions imposed cannot number more than six, will receive concessions.

Those who live in departments washed by the waters of the Rhone may have the right to all the power generated by the first station erected in any section, granted that application be made within one year from the moment production commences; if such application is made at a later date the right is nevertheless maintained at a quarter. If a single section is being exploited by a syndicate, building on another station must start as soon as consumers have been found for three-fourths of the existing plant's output. But concessionaries have the complete control of a quarter of their production, and, on the other hand, the department of the Seine—*i.e.*, Paris and neighborhood—has the right to 200,000 kw. as long as this amount does not exceed three-quarters of the total production.

This scheme may be supported out of public funds during the initial stage, and the state has always the right to at least 50 per.cent of the profits.

Preparing Equipment for Resumption of Business

Electrical Apparatus Which Has Been Lying Idle During the Past Business Depression Should Be Inspected to Ascertain if Insulation Has Absorbed Moisture—Methods of Drying Out Are Described

By R. F. STOKES
Walton-on-Thames, England

WHEN business activity starts again some of the factories, mills and other industrial establishments which have been closed or operated on only part capacity may experience trouble from electrical breakdowns unless precautions are taken to restore normal operating conditions. This may prove particularly true if the usual operating care has been curtailed, in collieries, chemical plants, paper mills and similar places where dampness is prevalent. Even where the equipment has received normal attention the methods of drying out insulation here described should be of value, since there are many other conditions than inactivity under which excessive moisture may be absorbed.

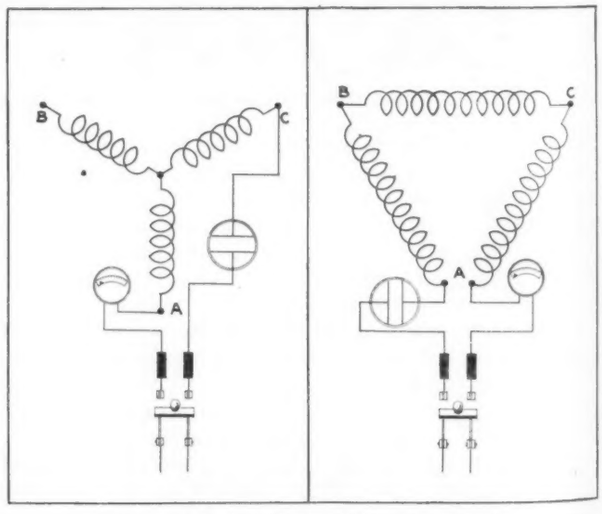
The conditions under which drying is necessary may be briefly summarized as follows: (1) After apparatus has been lying unused in a damp situation for more than a few days and shows on test a low insulation resistance; (2) where apparatus has become wet during transit from the makers; (3) where new coils have been placed in high-voltage machines. It should be borne in mind in deciding whether or not a machine requires drying that a good insulation test to the frame of the apparatus does not prove conclusively that it is in good condition. Experience with alternating-current machinery and transformers shows that the majority of breakdowns of windings do not occur from these to the frame of the apparatus, but as a rule the breakdowns result from short circuits between the turns of the coils in a winding. Many motor windings are incased in micanite, which very effectively resists moisture; but while this invariably gives a fair insulation test to the frame, no indication of the condition of the insulation between successive turns of the coils is thus afforded. Moisture may find its way in at the slot linings, or in the case of coils rewound on the site the insulation on the wire may become damp during replacing coils. Further, machinery may become damp in transit owing to neglect in packing or carelessness on the part of railroad men.

METHODS OF DRYING

Different types of apparatus call for different treatment. In some instances drying would be effected by placing the machine or transformers, as the case might be, in series with a resistance such as a tub of water containing two metal plates, or, if available, a suitable metallic resistance might be employed. Since the former can be obtained almost anywhere, its use is the more frequent. With other apparatus, such as generators, it is possible to dry out by running the machine short-circuited at a low speed, driven by a motor or an engine as convenient. Whatever method is employed, the chief object should be to see that only a low voltage is used, and where direct current is taken from a circuit with one pole earthed the apparatus being dried should be placed on the earthed side of the resistance, as shown in Fig. 1, where M is the apparatus to be dried, W the water rheostat, A an ammeter, F a fuse and S a single-pole switch for disconnecting the supply. When the supply has neither of its poles earthed, a double-pole switch and fuses should be used invariably.

In using a tub of water as a resistance the circuit should never be interrupted by means of the switch. Most apparatus is highly inductive, and the sudden interruption of a heavy drying current might give rise to an electromotive force sufficient to break down the insulation, especially should it happen to be in a very damp condition. To stop drying, one of the plates should be lifted from the tub and the switch then opened. This procedure reduces the current gradually and produces no ill effects. The plate may be replaced after the switch has been opened and drying may be recommenced when desired by merely closing the switch.

Since the usual electrolyte (salt solution) in a water rheostat increases in conductivity as the temperature rises, it is always advisable to start drying with a weak solution and low current, which will increase as the water gets hot. Then, if the drying current is insufficient, salt may be added until the desired current is obtained. The result of starting with a solution too strong is that the current soon rises beyond the required value, and to reduce it the solution has to be



FIGS. 1 AND 2—CONNECTIONS FOR DRYING THREE-PHASE WINDINGS

Left—Drying a star-connected machine when its neutral cannot be reached. Right—Delta connection opened at one point.

removed from the rheostat and clean water added to weaken it. This interrupts drying operations and should be avoided.

When commencing to dry out a machine the current should be raised very gradually, since the windings, not being ventilated by the rotation of the rotor, will become hot with a considerably lower current than the normal full-load value. Furthermore, since connections for drying are of a temporary nature, care is necessary to ascertain that instruments are working properly before strengthening the resistance solution to give a high drying current. Since the heat generated inside an insulated conductor has to pass through very poor heat-conducting material, the temperature outside will lag considerably behind that inside. Therefore the drying current should be increased very gradually; otherwise, before the outside temperature is sufficient to indicate overheating internal damage may have been done.

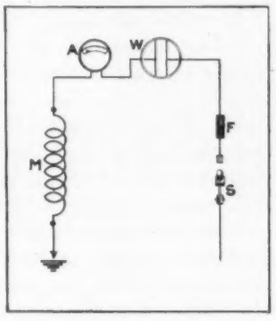


FIG. 3 — DRYING MOTOR OR TRANSFORMER FROM DIRECT-CURRENT CIRCUIT WITH GROUNDED LINE

So far as a generating plant is concerned, it is as a rule well housed and once installed is unlikely to need further attention in that respect even after a prolonged stoppage. However, when first installed it is sometimes necessary to dry the windings; but this is quite a simple matter, and all that is required is to drive the generator, whether direct-current or alternating, at reduced speed, with the amature or stator short-circuited through the main automatic circuit breaker and ammeter. The machine should be excited only sufficiently to generate enough current to warm up the windings.

DRYING DIRECT-CURRENT MOTORS

Direct-current motors in collieries or industrial works are usually of the shunt or compound type. One way to dry these is to run a machine short-circuited, using another motor or the overhead shafting in a machine shop as the driving medium. The motor to be dried should be separately excited from the lighting circuit with a lamp bank in series with it, so that the exciting current may be adjusted to make the armature generate full-load current. The preferable way is to disconnect the armature from its field windings and to pass a current through it while it is standing still, using connections similar to those shown in Fig. 3. In neither of these methods will the field windings be dried. Obviously the only way to warm the field winding without altering the connections is to connect it to the voltage for which it was designed, but assuming the insulation to be so damp as to render it inadvisable to do this, then the coils should be connected in parallel, so that a much lower voltage would be sufficient to effect the drying. This method would, of course, take a larger current, but provided a source of ample current at a reasonable voltage not above 500 is available, the connections in Fig. 3 would again meet the case.

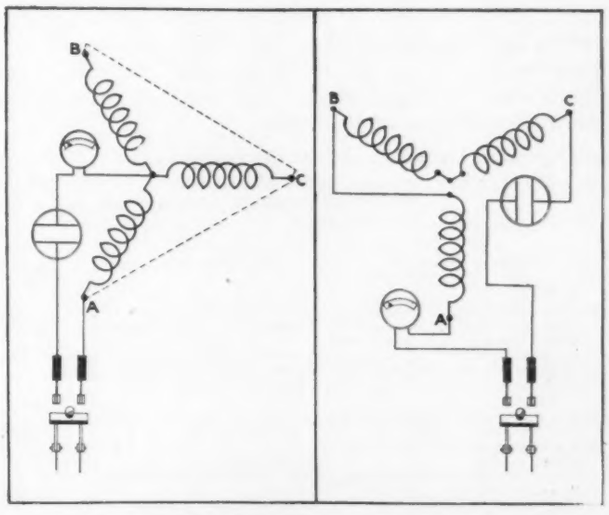
There are a number of methods of drying an induction motor. Everything depends on the type of winding and how it is connected. If the source of supply is alternating current, the rotor should be short-circuited if it is of the slip-ring type, so that it will be dried by induced current while the stator is being dealt with. If the supply is direct current, no current will be induced in the rotor, so that if it is of the slip-ring type, it will have to be treated separately. Short-circuited rotors need no drying, as they start with a heavy current and run up to speed immediately, whereas a slip-ring motor may be called upon to withstand an open circuit, or with very little current passing the electromotive force across the slip ring would be sufficient to cause a breakdown were the rotor insulation defective. In all cases where a three-phase supply at low pressure is available and where the voltage may be regulated at will the easiest method of drying is to connect the motor as for running, secure the rotor against turning and gradually raise the applied potential until sufficient current is indicated on an ammeter connected in the stator circuit. Under circumstances which preclude anything but drying by means of a temporary supply, using the method shown in Fig. 3, it is sometimes difficult to dry three-phase windings owing to the different methods of connection.

CONNECTIONS FOR STAR-CONNECTED WINDINGS

In machines with star connected windings a terminal box is often available at each end of the motor. One of these boxes contains the neutral or star point made by clamping a bridge across the three terminals. Under such conditions it is only necessary to remove the clamp, connect the three windings in series and join them as indicated in Fig. 5.

In most small motors in which the star connection is easily accessible, a convenient method of drying is to connect the three windings in parallel, as shown by the dotted line in Fig. 4, and make a connection from the star as indicated. The three windings are then in parallel and in series with the artificial resistance and the applied potential.

While the star connection of a large motor may be accessible, the parallel method of drying might require a very large current, possibly three times full-load current. Under such circumstances the connection of one winding should be broken at the star as shown in Fig. 5



FIGS. 4 AND 5—DRYING STAR-CONNECTED WINDINGS WHEN NEUTRAL POINT MAY BE REACHED

Left—Three phases temporarily connected in parallel. Right—Neutral opened, putting all phases in series.

and the three windings connected in series for drying. If the star connection of a motor is inaccessible, then the only course open is to dry two phases in series at a time as shown in Fig. 1. For instance, the connection is first made across, say, phases *A* and *C*, and after a few hours changed to *A* and *B*, and later to *B* and *C*, so that in turn all windings receive the same amount of treatment.

A mesh-connected winding may easily be dealt with by breaking the winding at a point *A*, shown in Fig. 2, and connecting the three windings in series.

In some cases it may happen that a potential suitable for drying in the manner described is unobtainable. Under such circumstances a machine should be covered over and a group of ordinary incandescent lamps hung inside the rotor spider, care being taken to see that they do not touch the insulation anywhere. Of course, this method of drying takes a much longer time than drying by passing a current through the windings, but given plenty of time it is quite effective.

DURATION OF DRYING

No hard and fast rule can be laid down as to how long a given machine should be dried to insure complete removal of moisture. An insulation test should be taken before drying commences. Another should be taken soon after a steady and sufficient temperature has been reached. The second test will always be found to be much lower than the first, but as drying proceeds the resistance should gradually rise. After, say, twenty-four hours current should be removed and the machine allowed to cool, after which, unless the machine was exceptionally damp, the insulation test will be quite satisfactory. In drying transformers they should always be removed from the tank so that the windings are accessible for judging the temperature. Thermometers should be inserted in the center of the windings since at these points the temperature is always highest and may reach a dangerous point before the exposed portions indicate that the drying current is too high. In conclusion, it should be noted that apparatus which has been saturated through being submerged may take weeks to dry, but careful attention and continuous application of drying current will as a rule bring about normal conditions of insulation.

Water-Power Applications Total 15,093,086 Hp.

Federal Power Commission Has Received 244 Applications for Preliminary Permits and Licenses and Has Issued Thirty-one

APPLICATIONS for preliminary permits and licenses continued to be filed with the Federal Power Commission during the summer months but at a slightly decreased rate. The commission on Aug. 31 reported that 244 applications were on file, an increase of 22 during the months of June, July and August. The net installed capacity of the projects on file Aug. 31 totaled 15,093,086 hp., which is about one and one-half times the present hydro-electric development of the country.

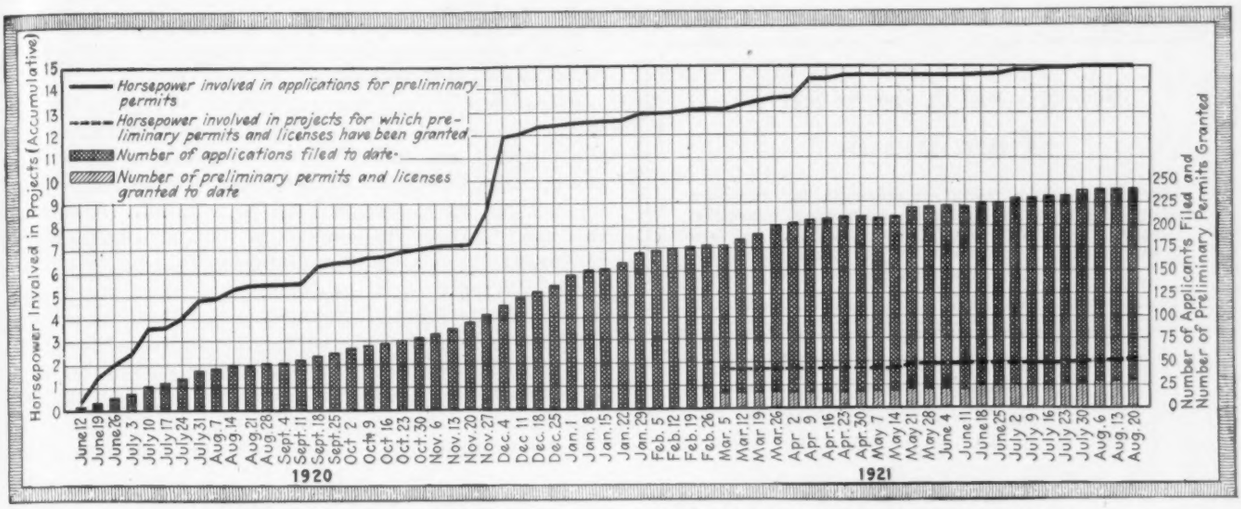
A recent compilation has been made giving the "power capacity" of the various applications as determined in accordance with the regulations of the commission on the basis of average static head, the stream flow estimated to be available 90 per cent of the time and operating at 70 per cent efficiency. This compilation indicates that the 244 applications filed with the commission total 10,274,000 hp. net power capacity.

The projects included in filings made during June, July and August involve an average of 34,100 hp. This is somewhat higher than the average horsepower involved in prior applications, if the unusually large project of the Southern California Edison Company in the Grand Canyon of Colorado is eliminated. Almost every section in the country is represented in the applications filed during these three months. Four of the projects are in Arizona, three in Alaska, California and Minnesota respectively, and one each in Arkansas, Idaho, Montana, Utah, Washington and West Virginia. Three applications for licenses were filed for transmission lines to be erected in California, Oregon and South Carolina respectively.

The largest project recorded during these three months was that of the city of Los Angeles at Boulder Canyon, Colorado River, involving a 600-ft. dam and a development of 600,000 hp. This application, however, is in conflict with previous filings. Two other projects in the Grand Canyon of the Colorado River, involving 130,000 hp. each, are also in conflict with former appli-

TABLE I—LOCATION AND SIZE OF WATER-POWER PROJECTS FOR WHICH APPLICATIONS FOR PRELIMINARY PERMITS WERE FILED WITH THE FEDERAL POWER COMMISSION FROM JUNE 4, 1921, TO AND THROUGH AUG. 31, 1921

Name of Company	Location of Project	Capacity Hp.
ALASKA:		
Frank C. Dougherty, Palace Hotel, San Francisco, Cal.	Green, Baranof and Second Lakes	20,000
Frank C. Dougherty, Palace Hotel, San Francisco, Cal.	Karta River, head of Karta Bay	6,000
Freshwater Bay Lumber Co., Douglas, Alaska	Stream at head of Pavloff Harbor, Chichagof Island	.....
ARIZONA:		
James B. Girand, Gooding Bldg., Phoenix, Ariz.	Colorado River at the mouth of Andrus Canyon	130,000
Steve Consolidated Copper Co., Phoenix, Ariz	Big Williams River	.....
James B. Girand, Gooding Bldg., Phoenix, Ariz	Colorado River, just above Pierce's Ferry	130,000
City of Los Angeles, Cal.	Boulder Canyon, Colorado River, Nev. and Ariz.	600,000
ARKANSAS:		
Dixie Power Co., Title Guaranty Bldg., St. Louis, Mo.	Buffalo River, near its junction with Panther Creek	19,000
CALIFORNIA:		
San Joaquin Light & Power Corpn., Fresno, Cal.	Three projects, Kings and Roaring Rivers and Bubbs Creek	50,000
James Hulme et al., Pine Knot, Cal.	Transmission line	.....
Mount Shasta Power Corporation, San Francisco	Pit River in Shasta County	114,000
Excelsior Water & Mining Co., 920 Forum Bldg., Sacramento, Cal.	Middle and South Forks of Yuba River and in Deer Creek	116,800
IDAHO:		
Haynes-Stellite Co., 30 East Forty-second St., New York City	Big Creek (plant constructed)	270
MINNESOTA:		
City of St. Paul	U. S. Government Dam, Mississippi River, at St. Paul	16,000
City of Minneapolis	U. S. Dam No. 1, Mississippi River	.....
Northern States Power Co.	U. S. Government Dam, Mississippi River, at St. Paul	16,000
MONTANA:		
Kootenai Power Construction Co., 347 Madison Ave., N. Y. City	Kootenai Falls, Kootenai River, and at Mouth of Yaak River	85,000
OREGON:		
Portland Railway, Light & Power Co., Portland, Ore.	Main Fork Clackamas River	.....
SOUTH CAROLINA:		
Southern Power Co., Charlotte, N. C.	Transmission line	.....
UTAH:		
Blue Mountain Irrigation Co., Monticello, Utah	Pole canyon (constructed plant)	40
WASHINGTON:		
Washington Water Power Co., Spokane, Wash	Kettle Falls, Columbia River	153,000
WEST VIRGINIA:		
C. B. Hawley, 450 Munsey Bldg., Washington, D. C.	Sandstone Falls, New River	4,500


Horsepower Involved in Projects (Accumulative)
Horsepower involved in applications for preliminary permits
Horsepower involved in projects for which preliminary permits and licenses have been granted
Number of applications filed to date
Number of preliminary permits and licenses granted to date
Number of Applicants Filed and Number of Preliminary Permits Granted
1920
1921

GROWTH IN NUMBER OF APPLICATIONS FILED AND GRANTED AND NET HORSEPOWER INVOLVED

cations. The largest project which is not all or partly in conflict with former applications is that of the Washington Water Power Company at Kettle Falls, Columbia River, involving a development of 153,000 hp.

Table I gives the location and size of the water-power projects for which applications for preliminary permits and licenses were filed with the Federal Power Commission from June 4, 1921, to and through Aug. 31, 1921. The list of applications filed prior to June 4 appeared in the issues of the ELECTRICAL WORLD for Jan. 1, Jan. 15, Feb. 12, March 12, April 9 and June 18.

A total of thirty-one permits had been granted by the commission on Aug. 24, of which fourteen were preliminary permits and seventeen were licenses. The developments represented in these projects involve a total of 2,255,696 hp. and are scattered throughout the country. California leads in proposed horsepower to be developed with 784,386 hp., followed by New York State with 663,250 hp. The largest project for which a license has been granted by the commission is that of the Southern California Edison Company on Big Creek and the South Fork of the San Joaquin River, California, involving a total development of 545,000 hp.

Table II gives the location and size of the projects for which preliminary permits and licenses have been granted.

TABLE II—LOCATION AND SIZE OF WATER-POWER PROJECTS FOR WHICH PRELIMINARY PERMITS OR LICENSES HAVE BEEN GRANTED BY THE FEDERAL POWER COMMISSION THROUGH AUG. 24, 1921

Name of Company	Location of Project	Capacity Hp.
ALABAMA (120,000 hp.):		
Alabama Power Co., Birmingham, Ala. (license)	Duncan's Riffle, Coosa River	120,000
ARIZONA (60,000 hp.):		
James B. Girand, Gooding Bldg., Phoenix (preliminary permit)	Colorado River near Diamond Creek	60,000
ARKANSAS (100,000 hp.):		
Dixie Power Co., Title Guaranty Bldg., St. Louis, Mo. (preliminary permit)	White River	100,000
CALIFORNIA (784,386 hp.):		
Pit River Power Co., San Francisco (preliminary permit)	Pit River	92,000
Merced Irrigation District, Merced Cal. (preliminary permit)	Exchequer on Merced River	40,000
R. W. Hawley, 233 Market St., San Francisco (preliminary permit)	Silver Creek	107,000
Luther Hill, Independence, Cal. (license)	Sam Mill Creek	386
Southern California Edison Co., Edison Bldg., Los Angeles, (license)	Big Creek and South Fork of San Joaquin River	545,000
Southern California Edison Co., Edison Bldg., Los Angeles (license)	Transmission line	.....
C. B. Johnson, Care V. G. Preston, Bishop (license)	Transmission line	.....
Coast Valleys Gas & Electric Co., San Francisco (license)	Transmission line	.....
COLORADO:		
Thomas P. Mitchell, Ouray, Col. (license)	Transmission line	.....
IDAHO (21,900 hp.):		
Utah Power & Light Co., Salt Lake City, Utah (preliminary permit)	Soda Point, Lava, Narrows and Mink power sites on Bear River	21,500
John R. Lore, et al., Care J. D. Fisher, Colorado Springs, Colo. (license)	Salmon River, Custer County	400
ILLINOIS (40,000 hp.):		
State of Illinois, Springfield, Ill. (preliminary permit)	Desplaines and Illinois Rivers	40,000
MISSOURI (4,000 hp.):		
Western Tie & Timber Co., 902 Syndicate Trust Bldg., St. Louis, Mo. (preliminary permit)	Current River	4,000
MONTANA:		
Butte-Jardine Metals Mines Co., Butte, Mont. (license)	Transmission line	.....
MONTANA:		
Amazon Dixie Mining Co., Wallace, Idaho (license)	Transmission line	.....
NEVADA:		
Consolidated Spanish Belt Silver Mining Co., 629 Nicholas Bldg., Toledo, Ohio (license)	Transmission line	.....
NEW YORK (663,250 hp.):		
Hydraulic Race Co., Lockport, N. Y. (preliminary permit)	Niagara River	5,000
Lower Niagara River Power & Water Supply Co., Care H. L. Cooper, 101 Park Ave., N. Y. City (preliminary permit)	Niagara River	250,000
Ford Motor Co., Dearborn, Mich. (license)	Green Island, Hudson River	8,250
Niagara Falls Power Co., Niagara Falls, N. Y. (license)	Niagara River	400,000
NORTH CAROLINA (2,000 hp.):		
Granite Falls Manufacturing Co., Granite Falls, N. C. (preliminary permit)	Wilson Creek	2,000
OHIO (150 hp.):		
McConnelsville-Malta Electric Co. McConnelsville, Ohio (license)	U. S. Dam No. 7, Muskingum River	150
SOUTH DAKOTA:		
Paving Granite Quarry Co., Rapid City, S. D. (license)	Transmission line	.....
UTAH (25,000 hp.):		
Great Basin Power Co., Walker Bank Bldg., Salt Lake City (preliminary permit)	North Fork Duchesne River	25,000
VIRGINIA (60,000 hp.):		
Roanoke River Development Co., 318 Mutual Bldg., Richmond, Va. (preliminary permit)	Roanoke River	60,000
WASHINGTON (300,000 hp.):		
Washington Irrigation & Development Co., Care Electric Bond & Share Co., 71 Broadway, New York City (preliminary permit)	Columbia River	300,000
WISCONSIN (75,000 hp.):		
Wisconsin-Minnesota Light & Power Co., 1107 Grand Rapids Savings Bldg., Grand Rapids, Mich. (license)	Forks of Chippewa River	75,000
WYOMING (10 hp.):		
Home Colony, Cody, Wyo. (license)	Kitty Creek, Park County	10

Readers' Views and Comments

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Interplanetary Communication

To the Editors of the ELECTRICAL WORLD:

There are countless worlds such as ours in the universe—planets revolving around their suns in elliptical orbits and spinning on their axes like gigantic tops. They are composed of the same elements and subject to the same forces as the earth. Inevitably at some period in their evolution light, heat and moisture are bound to be present, when inorganic matter will begin to run into organic forms. The first impulse is probably given by heliotropism; then other influences assert themselves, and in the course of ages, through continuous adjustment to the environment, automata of inconceivable complexity of structure result. In the workshop of nature these automatic engines are turned out in all essential respects alike and exposed to the same external influences.

The identity of construction and sameness of environment result in a concordance of action, giving birth to reason; thus intelligence, as the human, is gradually developed. The chief controlling agent in this process must be radiant energy acting upon a sense organ as the eye, which conveys a true conception of form. We may therefore conclude with certitude that, however constructively different may be the automata on other planets, their response to rays of light and their perceptions of the outside world must be similar to a degree so that the difficulties in the way of mutual understanding should not be insuperable.

Irrespective of astronomical and electrical evidences, such as have been obtained by the late Percival Lowell and myself, there is a solid foundation for a systematic attempt to establish communication with one of our heavenly neighbors, as Mars, which through some inventions of mine is reduced to a comparatively simple problem of electrical engineering. Others may scoff at this suggestion or treat it as a practical joke, but I have been in deep earnest about it ever since I made the first observations at my wireless plant in Colorado Springs from 1889 to 1900. Those who are interested in the subject may be referred to my articles in the *Century Magazine* of June, 1900, *Collier's Weekly* of Feb. 9, 1901, the *Harvard Illustrated Magazine* of March, 1907, the New York *Times* of May 23, 1909, and the New York *Herald* of Oct. 12, 1919.

At the time I carried on those investigations there existed no wireless plant on the globe other than mine, at least none that could produce a disturbance perceptible in a radius of more than a few miles. Furthermore, the conditions under which I operated were ideal, and I was well trained for the work. The arrangement of my receiving apparatus and the character of the disturbances recorded precluded the possibility of their being of terrestrial origin, and I also eliminated the influence of the sun, moon and Venus. As I then announced, the signals consisted in a regular repetition of numbers, and subsequent study convinced me that they must have emanated from Mars, this planet having been just then close to the earth.

Since 1900 I have spent a great deal of my time in trying to develop a thoroughly practical apparatus for the purpose and have evolved numerous designs. In one of these I find that an activity of 10,000,000,000 hp. in effective wave energy could be attained. Assuming the most unfavorable conditions—namely, half-spherical propagation—then at a distance of 34,000,000 miles the energy rate would be about $\frac{1}{730,000}$ hp. per square mile, which is far more than necessary to affect a properly designed receiver. In fact, apparatus similar to that used in the transmission of pictures could be operated, and in this manner mathematical, geometrical and other accurate information could be conveyed.

I was naturally very much interested in reports given out about two years ago that similar observations had been made, but soon ascertained that these supposed planetary signals were nothing else than interfering undertones of wireless transmitters, and since I announced this fact other experts have apparently taken the same view. These disturbances I observed for the first time from 1906 to 1907. At that time they occurred rarely, but subsequently they increased in frequency. Every transmitter emits undertones, and these give by interference long beats, the wave length being anything from 50 miles to 300 or 400 miles. In all probability they would have been observed by many other experimenters if it were not so troublesome to prepare receiving circuits suitable for such long waves.

The idea that they would be used in interplanetary signaling by any intelligent beings is too absurd to be seriously commented upon. These waves have no suitable relation to any dimensions, physical constants or succession of events, such as would be naturally and logically considered in an intelligent attempt to communicate with us, and every student familiar with the fundamental theoretical principles will readily see that such waves would be entirely ineffective. The activity being inversely as the cube of the wave length, a short wave would be immensely more efficient as a means for planetary signaling, and we must assume that any beings who had mastered the art would also be possessed of this knowledge. On careful reflection I find, however, that the disturbances as reported, if they have been actually noted, cannot be anything else but forced vibrations of a transmitter and in all likelihood beats of undertones.

While I am not prepared to discuss the various aspects of this subject at length, I may say that a skillful experimenter who is in the position to expend considerable money and time will undoubtedly detect waves of about 25,470,000 m.

NIKOLA TESLA.

New York City.

Period of Repose in Rate Cases

To the Editors of the ELECTRICAL WORLD:

In a decision of the New York Public Service Commission, Second District, as quoted in the Aug. 20 issue of the ELECTRICAL WORLD, page 389, there are two points that should be corrected. The first is a typographical error and the other concerns a fact not generally known.

The name of the company is the Lockport (not Lockwood) Light, Heat & Power Company. The other point is that about two weeks after the decision referred to was handed down the commission reversed itself and decided that it had been in error as to the law.

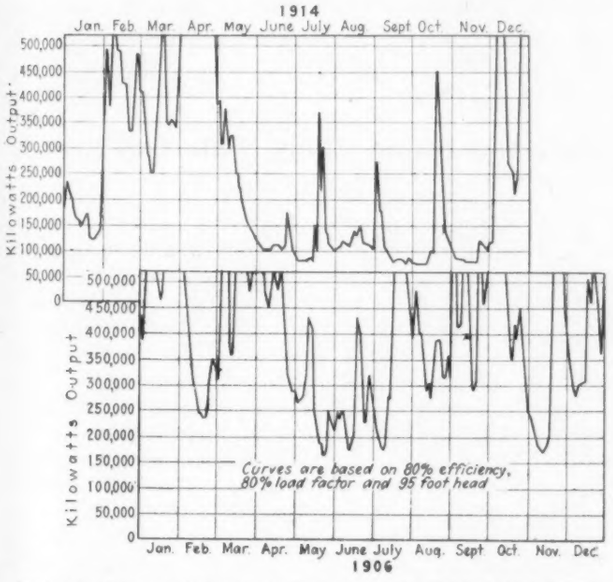
This reversal, like many such decisions of public utility commissions, does not seem to have received much publicity. However, the Lockport company received the increase for which it asked. H. C. HOPSON.

New York City.

Primary Power Possible of Development at Muscle Shoals

To the Editors of the ELECTRICAL WORLD:

I have read with interest the discussion which has taken place in the press regarding the Wilson Dam development at Muscle Shoals and the offer which has been made by Henry Ford for taking over that proposition. Throughout this discussion there has been apparent an exaggerated idea of the hydraulic capacity of the plant. Reference has been made in the various published articles to the development as a "second Niagara," "the enormous power of Muscle Shoals," etc. In a recent issue of *Power* Gifford Pinchot makes the following statement: "The amount of power Mr. Ford could develop under his offer is greater by half than that now



HYDROGRAPHS SHOWING LOWEST FLOW OF TENNESSEE RIVER (1914) AND THE HIGHEST FLOW YEAR (1906)

being developed at Niagara Falls." Since the power now developed at Niagara Falls is in round figures about 600,000 kw. continuous power, Mr. Pinchot's statement would indicate for the Wilson Dam a capacity of 900,000 kw. continuous power. Such statements are misleading and contrary to fact.

I inclose herewith two hydrographs showing the hydraulic capacity of the Wilson Dam based upon the run of the stream converted into electrical output. The over-all efficiency in these curves is taken at 80 per cent. The daily load factor is assumed to be 80 per cent, since that is approximately the load factor of the Niagara system and of other large power systems where an electrochemical load predominates. One hydrograph shows the result for the lowest flow year in a period of twenty-one years and the other for the highest year for the same period. An average year would lie between.

On account of the navigation restrictions the pond back of the Wilson Dam cannot be drawn down more than one or two feet, consequently the storage back of the dam is only sufficient to take care of the daily fluctuations in load. The output of the plant will therefore be proportional only to the natural flow of the Tennessee River at the dam.

From the curves it will be seen that for a low year such as 1914 the primary power which could be generated throughout the year from water power alone would not exceed 80,000 kw. at 80 per cent load factor. For a particularly favorable year such as 1906 the primary power would be about 180,000 kw. Neither of these figures is comparable to the present output at Niagara Falls.

If the primary power capacity of the Wilson Dam is to be raised to say 200,000 kw., for all years, then a steam plant of not less than 120,000 kw. will be necessary to make up the deficiency in water power and a large proportion of the annual kilowatt-hour output must be generated by steam. The capital and operating cost of such a steam plant must, of course, be added to the water-power estimates.

There would, of course, be a large amount of secondary power available from the plant for perhaps six months in the year which might be utilized for electrochemical processes. The high capital cost, however, of an electrochemical plant per kilowatt used in its processes makes it unprofitable in most cases to use secondary power for only part of the year even where the secondary power rate is low. Power companies have found it very difficult to induce electrochemical industries to establish themselves on the basis of secondary power use alone.

Possibly the argument over the Muscle Shoals enterprise might be clarified if a reasonable power rating were assigned to the plant within the natural limitations of river flow and a value discussed for the plant which had an appropriate relation to such rating.

Vielé, Blackwell & Buck, H. W. BUCK.

New York City.

Electric Steam Generators for Heating Railway Cars

To the Editors of the ELECTRICAL WORLD:

The writer has noticed a short item in the June 25 issue of the ELECTRICAL WORLD, page 1485, in which Henry L. Geissel of Thoune, Switzerland, refers to electrical heating methods to be used on the cars of the Swiss Federal Railways.

Some ten or twelve years ago the writer was connected with investigations in connection with boilers for generating steam to be used for heating cars in the Pennsylvania Railway Company's tunnel in New York City. In that case the steam generator was placed in the cab of the locomotive and steam was applied to the passenger cars through the usual steam lines of the train. Those boilers were for operation on 650 volts direct current and consisted of flat copper tubes extending vertically between the headers of the boiler. In these copper tubes were flat slotted-ribbon resistance elements. These elements were insulated from the copper tube by casings of mica.

The operating results from the high-tension boilers which the Swiss Railways are using, after they have been in service for a sufficient period, will be very interesting from the standpoints of usefulness and durability.

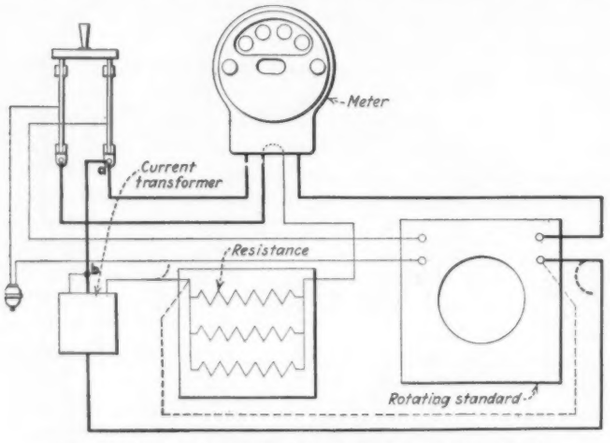
FRANK THORNTON, JR.,
Manager Electric Heating Engineering Department.
Westinghouse Electric & Manufacturing Company,
Mansfield, Ohio.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Current Transformer for Testing Meters

AN ORDINARY current transformer will be found very convenient in testing alternating-current house meters of medium and large size (above 20 amp.) if a loading box of sufficient capacity is not available or is too large to be easily carried around. The trans-



METHOD OF CONNECTING CURRENT TRANSFORMER FOR METER TEST

former is connected backward so that it multiplies the current capacity of the loading resistance by what is virtually the transformer ratio. Thus a 10-amp. resistance box and a 50/5-amp. current transformer will give almost 100 amp. load.

The connections are easy to make, as shown by the diagram, which gives connections for a single-phase, two-wire meter. Connections for other meters can easily be worked out. A spade terminal on the cable at *a* will facilitate making easy connection with the service switch. The dotted lines show necessary change in connections for testing on "light load" without having a transformer in the circuit. After the first meter is tested permanent connection may be made at *b*, and there will be no further trouble in getting the right polarity.

OTIS T. FARRY.

Nevada, Mo.

Receiver for Determining Grounded Service Wire

AN ORDINARY telephone receiver, or, better still, one of the wireless headset type, will serve as a convenient device for determining which secondary service wire is grounded when installing and testing two-wire alternating-current meters. A small receiver is less likely to be injured while being carried around than the test-lamp set ordinarily employed, and, besides, it requires less space in the meter installer's or tester's kit. Furthermore, it can be used where the test lamp cannot, owing to the fact that a good earth connection is not necessary.

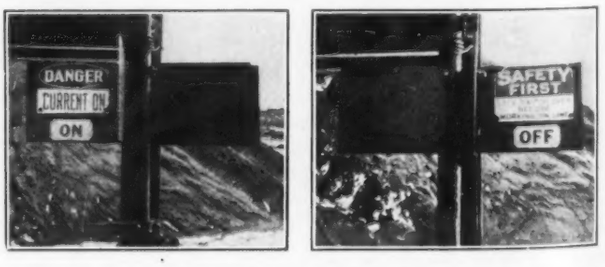
To use the receiver for this purpose a single-conductor cord with a tip is attached to one of the receiver terminals, the operator's finger touched to the other terminal, and the conductor tip touched to each of the service wires in turn. A decided hum will be heard when the cord tip is applied to the ungrounded side, while no hum at all or at least only a slight one will be heard when it is connected to the grounded wire.

The theory of operation is simple, the capacity effect of the body causing a slight charging current from the line to pass through the receiver. The greatest effect will be detected when the ungrounded service wire is touched, since under this condition the body and earth will at every instant be charged at opposite potentials.

Red Oak Electric Company, FOSS C. HUSH.
Oakland, Iowa.

Indicator Shows When Pole-Top Switch Is Closed

AFTER the occurrence of several accidents due to climbing poles when the power was on, a company which uses a large number of pole-top switches decided that some sort of an indicator to show the position of the switch would be worth while. The switches are of the horizontal-break type with rotating operating rod, but the plan as described could be modified to suit the vertical-break type of switch having an up-and-down movement of the operating rod. Standard steel enameled signs are mounted on the baseboard, which is so clamped to the operating rod as to expose the "Danger, current on," sign when the switch is closed. When the switch is opened the movement of the operating rod through an arc of 90 deg. turns the shutter so as to cover up the first sign and expose the "Safety first, off," sign. This has an additional reminder to "Lock switch open before working a line" so as to prevent another person closing the switch. The shutter is a piece of No. 10 sheet steel, 11 in. x 33 in., bent at right



SIGNAL SHOWS WHETHER POLE-TOP SWITCH IS OPEN OR CLOSED

angles. This is bolted to the switch operating rod by two standard 1¼-in. "U."-bolt panel supports. A baseboard of 12-in. x 30-in. No. 8 gage sheet steel is fastened to the pole, and on this are fastened the signs.

The pole steps should be attached to the pole upon which the indicating device is mounted so that a line-

man must climb past the sign on his way up. An actual installation is shown by the photographs, showing the position of the switch closed and open. This device has been in service for over a year and has proved very satisfactory.

E. B. WAGNER,
Electrical Engineer.
Lehigh Valley Coal Co.,
Kingston, Pa.

The Penalty for Carelessness in Operation

ON PAGE 22 of the July 2 issue of the ELECTRICAL WORLD "E. A. L." criticises the connection of oil-switch tripping coils to the station exciter bus. The writer has a different opinion on the subject. In the majority of power houses, and especially those of the larger sizes, there are usually automatic voltage regulators.

When a short circuit occurs on one of the high-tension lines the regulator tends to maintain the alternating current busbar voltage as close to normal as possible, and in so doing the exciter voltage is, of course, correspondingly increased. This is particularly desirable to assure positive operation of the tripping coils. Usually, however, direct-current tripping coils connected for switch protection have an operating range of 75 volts to 125 volts.

R. H. N. LOCKYER.
Bonnington Falls, British Columbia.

Complete Transformer Records

IT IS desirable to have complete and accessible records of the data on station transformers, not only at the station where the transformers are installed, but also in the various offices which are concerned with those particular transformers. With this end in view the Southern California Edison Company has developed a station transformer data sheet, a copy of which is attached directly to the transformer where it may be easily seen, while other copies are placed in the hands of those concerned.

This data sheet covers the following points: location of the transformer as to station and bank, name-plate information, physical characteristics, date of purchase, rated voltages (that is, all possible voltages that can be obtained by terminal-board connections) and present voltage connections. Space is allowed to enter several previous connections, the polarity of the transformer together with a definition of polarity and directions for determining it, the insulation resistance obtained when the transformer was last dried out, the oil record, the record of oil tests and instructions as to the use of the data sheet.

This form is printed on sheets of three different colors, white, brown and yellow. The white and yellow sheets are 8½ in. x 11 in., so that they may be filed in letter files. The brown sheets, which are never filed, but are used only for pasting on the transformers, are 8½ in. x 13 in. This added length is for the purpose of giving more space for the oil-test records, which are made quite frequently.

The white sheets are intended for the field foreman to use in sending the information to the electrical engineer's office. In that office the white copy is checked and all available additional information is entered thereon. Then one brown copy and five yellow copies are typed, the brown copy being returned to the field foreman for pasting on the transformer and the yellow copies being sent to the various offices concerned. White shellac is used to paste the brown copy on the transformer. This has proved quite durable, even on outdoor transformers.

The data sheet, while originally intended for station transformers only, is now being used for all transformers of 250 kva. or larger. On transformers having a corrugated tank the sheet is pasted on a piece of sheet metal which is hung by a metal strap from the top casting.

This form of transformer data sheet has been found

SOUTHERN CALIFORNIA EDISON COMPANY

STATION TRANSFORMER DATA SHEET

Station Llewellyn Sub., Torrance Bank No. 3

Rating K. V. A. 800 — Weight with oil 9700 lbs.
Manufacturer General Electric Co. — Weight without oil 5200 "
Serial Number 1827298 — Gallons of oil 880 gal. 4000 "
Date purchased 1918 - Contract No.9228 — Gallons of water per minute C.A.S.Co.
Max. safe temp. by installed thermometer 70° C

Rated Voltages:
High Tension { Delta 18000 / Star
Low Tension { Delta 2300 - 2300 - 2400 / Star

Wiring Diagram Drawing No. 10640 Eng.Dept., 137 Test Dept.

Present Connections: For outdoor service

DATE	HIGH TENSION	Δ	Y	⊥	LOW TENSION	Δ	Y	⊥	SIGNATURE
4/4/19	18000	X			2300	X			F.C. Lord

Indicate whether connection is delta, star or scott by placing cross (X) below proper connection.

POLARITY TEST
ALL CONNECTIONS OUTSIDE OF CASE

With any voltage (V) impressed on the high tension terminals 1 and 2, and with terminals 2 and 3 connected as shown, a voltmeter connected between 1 and 4 (Vp) will show more or less than impressed voltage (V). More indicates Additive Polarity. Less indicates Subtractive Polarity. Subtractive Polarity is the N.E.L.A. Standard Polarity.
Indicate polarity by writing test values of V and Vp in table below.

V	Vp
98	109

Signed T.A.Livesey, Field Foreman
Date 4/10/19
Approved J.A.Lighthipe, Chief Elec. Engineer
Date 4/10/19

Dryout Results—Megohms:
Date 3/7/19 High to Low 750 High to Ground Infin. Low to Ground 1000 Signature R.Ford

Oil Record:

DATE	OIL FILTERED	OIL ADDED—GALLONS	GRADE OF OIL	MANUFACTURER	SIGNATURE
3/7/19	From drums		S AA	G.T.Co.	F.C.Lord

Oil Tests

DATE	TEST KV	SIGNATURE	DATE	TEST KV	SIGNATURE
3/19/19	42 plus	Test Dept.			

ONE RECORD LIKE THIS IS PASTED ON STATION TRANSFORMERS AND COPIES ARE SENT TO VARIOUS FILES

The following instructions are printed at one side of the sheet though not shown in the above cut:

A. When a new installation of transformers is made in any station: (1) Field foreman shall make out and forward to the office of chief electrical engineer a single white copy of data sheet, noting thereon "new installation, brown copy required." (2) Office of chief electrical engineer shall make up on typewriter: (a) One brown copy for foreman in field to paste on transformer with white shellac, where it can be easily read by person standing on floor; (b) five yellow copies, one for load dispatcher, two for general superintendent of division concerned, one for test department and one for chief electrical engineer.

B. When connections are changed on any existing installation of transformers: (1) Field foreman shall make out and forward to office of chief electrical engineer a single white copy of data sheet, covering changes. (2) Field foreman shall make a record of changes in table of "present connections" with drawing (India) ink on brown copy attached to transformer. (3) Office of chief electrical engineer shall make up on typewriter five yellow copies as per instructions under A-2-(b) above.

C. When oil is tested, filtered, changed or added in an existing installation of transformers, field foreman shall make record with drawing (India) ink under "Oil Record" on sheet attached to transformer.

D. When table of "Present Connections," or table of "Oil Record" becomes full, instructions under "A" above shall be followed, except that field foreman's notation shall be "Record full, new brown copy required." Field foreman shall make white copy and exact duplicate of the brown copy posted on transformer, except that only the last two records of "Oil Tests" shall be given.

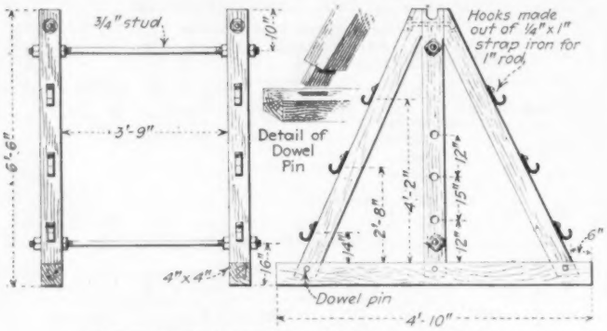
to meet the requirements quite completely, with the one exception that no provision was made for the statement that the transformer is for outdoor or indoor service. This information is being typed in a blank space on the sheet at present, but will be included in the form in the future.

H. MICHENER.
Southern California Edison Company,
Los Angeles, Cal.

Rack Holds Ten Rolls of Insulating Material

A RACK built to hold the various rolls of insulating material used around an electrical repair shop is shown in the accompanying illustration. The stand is made to hold ten rolls of material. It is placed directly back of a 44-in. strawboard-cutting machine, so that the material can be fed from any roll and cut on the machine. This keeps the ends true and reduces waste.

In this shop an insulation-cutting department has



INSULATING MATERIAL STORED IN THIS RACK IS EASILY HANDLED BY THE CUTTER

been established and put in charge of a young man whose duties are to cut material of all kinds for the whole shop. Having one man in charge of the work eliminated the waste incident to the old system of having each winder or other mechanic get out and cut his own material. The man in charge of the insulation department receives a copy of all coil orders, which is his notice to cut winding material. He makes all measurements and supplies the required slot material, fillers, etc., which are approved by the man in charge of the department in which the motor is being rewound. In no case is a written order required for material. The man requiring material just notifies the insulation cutter, who takes the required notes, and the material and the time used in cutting are charged by the cutter to the proper order number.

The material is issued to the cutter in bulk, *i.e.*, 100-yd. rolls and 25-lb. lots in sheet form, by the main storeroom, which has a card for each kind of material

INSTRUCTIONS FOR SELECTING SLOT MATERIAL

Fullerboard (FB) used as a slider, in open-slot machines where a tight fit is wanted and where a slider is desired that will not pull down with the coil.

Fishpaper (FP) used for sliders on alternating-current and direct-current open-slot machines. This should be used in the majority of cases in preference to fullerboard, particularly in bad cores where the laminations are uneven. It is a very hard paper and will resist abrasion and at the same time it is very flexible and easy to crease.

Treated Cloth (TC) used for cells, etc., on alternating-current and direct-current machines together with fishpaper and fullerboard, and also as insulation between coil ends on threaded-in windings, for which purpose it is cut in triangular shape.

Oiled Duck (OD) used between top and bottom layers of coil ends and under leads, etc.

Fiber used for wedges, separators and fillers.

Combination (Comb) used for cells in all closed-slot machines, also for channel-shaped separators between the top and bottom coils in a slot. Combination insulation is made with a fishpaper base and with 0.008-in. tan or black treated cloth shellacked to the base. The most convenient size has a total thickness of 0.023-in. This material was developed primarily to be used for cells on partially-closed slot machines where the opening was narrow and a treated cloth slider projecting through this opening would decrease the width through which the wire was put; also on jobs where a treated cloth cell would pull down with the wires and fill up the slot.

Kraft Paper (KP) used for top-winding cells, when combination is used. Kraft paper is 0.004 in. thick and is a thin, hard, treated paper that will not pull down or crack easily.

Fishpaper (0.056 in.) used for wedges in connection with combination.

INSULATING MATERIAL KEPT IN CUTTING DEPARTMENT OF LARGE MOTOR-REPAIR SHOP

Material	Thickness, In.	Width, In.	Length
Fishpaper.....	0.004, 0.007, 0.0010 and 0.015	36 or 40	100-yd. roll
	0.023	36	40-in. sheet
Fullerboard.....	0.007, 0.010 and 0.015	36 or 40	100-yd. roll
Oiled duck.....	.....	36 or 40	100-yd. roll
Treated kraft paper	0.006	36 or 40	100-yd. roll
Tan-treated cloth.	0.008	36 or 40	100-yd. roll
Combination paper*	0.023	36	40-in. sheet
Fiber.....	1/32 and 1/16	36	40-in. sheet

* Combination paper has a 0.015-in. fishpaper base shellacked to 0.007-in. tan-treated cloth.

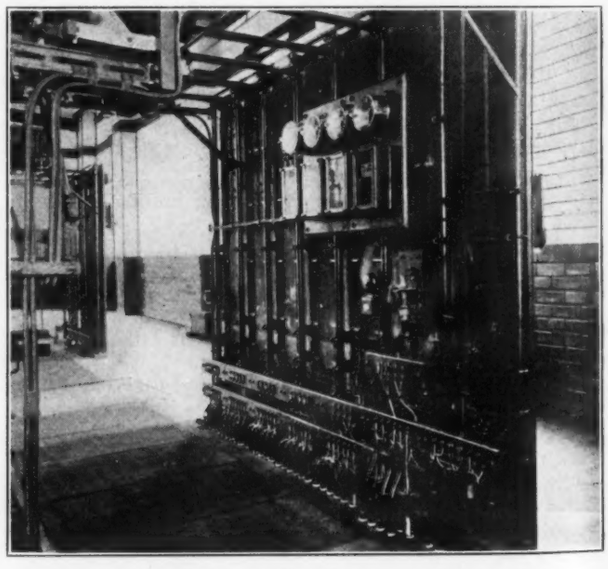
containing the date and the amount issued. The cutter weighs the material for each job and makes out a material requisition, which is turned into the storeroom each morning. Here the weights of the different materials turned in on job numbers are totaled and then put on the cards, one for each material.

The materials kept on hand in the cutting department are shown in the attached table. Segment mica and heavy fiber are kept in the main storeroom.

Detroit, Mich. A. C. ROE.

Accessible Terminal Connections at Industrial Switchboard

IN A MASSACHUSETTS industrial plant where the electrical equipment has been installed to facilitate continuous production special attention was given to convenient switchboard wiring. For example, the board illustrated in the accompanying photograph is provided with terminal strips at the rear to which all the principal control circuits are attached, the leads being brought up from a conduit through below as vertical risers passing through floor bushings. Provision is made on



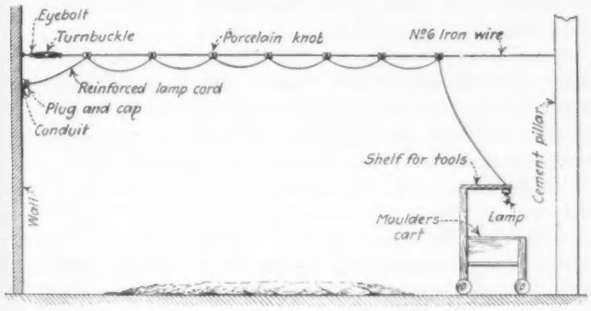
ALL CONTROL CIRCUITS CONNECT TO TERMINAL STRIP AT BACK OF BOARD

the terminal strips for fuse clips where necessary, and all connections are made at from 8 in. to 15 in. above the floor to facilitate testing. Circuits are run from various points in rigid conduit to the floor trench shown, access being easy by raising the corrugated plates covering the trough. This arrangement facilitates the initial pull-in of conductors, makes changes and testing rapid and inexpensive, and cuts down exposed wiring runs above the floor to the minimum.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Cord for Portable Machine Kept from Injury

A SAFE plan for supplying current to portable machines is used by the writer in foundry work for molders' carts. This plan is to stretch over the sand pile a heavy iron wire with a turnbuckle at one or both ends. On this wire a few porcelain knobs or spools are strung. Heavy reinforced lamp cord is looped to each porcelain insulator, to which it is held by strong marlin or other non-conductor cord. There must be enough knobs to keep the loops from sagging low enough to



CORD LOOPS OUT OF WAY AS CART MOVES AROUND

hit the molder's head. At the end of the wire is the outlet from conduit or other source. The outlet has a plug receptacle for taking a two-prong plug on the lamp cord. A plug on the other end of the cord fits a socket on the cart. The wires of the cord used in a foundry should be well tinned before being placed under the screws of the plug.

With this installation the molder can move his cart back and forth and his cord will follow without injury. If he should pull too hard on the cord, it will pull the plug from the receptacle without injury to the cord. It may be replaced without aid of an electrician. Before this system was installed the cord was allowed to drag on the floor, which often resulted in the cord being run over and becoming tangled in the wheels of the cart and often having hot ladles or hot iron placed on it. In the former installation the cord was tapped directly on to the main feeder at the outlet, and when the cord was pulled at that connection short circuits often resulted.

Batavia, N. Y. N. S. DAVIS.

Electric Power Saves Cost in Oil Well Drilling

AS THE result of several tests made in the mid-continent field electric power has shown a material saving in the cost of oil-well drilling as compared with steam. The savings arise from use of less water and no oil fuel, from smaller depreciation of equipment and from the increased oil production gained by the saving in time when changing from drilling to pumping equipment. The data in the accompanying tables are taken from a well-drilling operation in the El Dorado field in Kansas in August and September, 1919. A 75-hp., 440-volt induction motor was used as standard drive in these operations. The total saving on each well drilled was $3,882.67, of which $2,577.67 was in equipment, installation and operation costs and $1,305 due to increased production. A tabulation of weekly electrical costs for three weeks is given in Table I.

TABLE I—WEEKLY COSTS OF DRILLING OIL WELL WITH ELECTRICAL EQUIPMENT

	Week 1	Week 2	Week 3
Line construction labor	$52.28	$94.70	$74.06
Motor installation labor	50.50	64.14	75.04
Transportation	28.75	168.75	37.72
Inspector	109.50	118.01	182.69
Material not reclaimable	40.00	40.00	40.00
Changing motor and service to pumping equipment	101.56	101.14	135.29
Sub-total	$382.29	$586.74	$504.90
Cost of electricity	316.65	506.90	367.40
Grand total	$699.24	$1,093.64	$872.30
Cost per foot drilled electricity only	0.134	0.210	0.155
Cost per foot drilled, total electrical costs	0.294	0.454	0.369

TABLE II—COST OF ELECTRIC OIL-WELL EQUIPMENT COMPARED WITH STEAM-DRIVEN EQUIPMENT
El Dorado Field, Kansas, August and September, 1919

	Boiler and Engine	Electric Motor
Initial cost of equipment	$1,862.00	$1,625.00
Cost of installation	432.50	768.03
Estimated depreciation per well	290.00	32.50
Cost of water	480.60	60.00
Total	$3,065.10	$2,475.53
Saving in cost of electrical equipment over steam equipment		$579.57
Saving in difference between cost of fuel and electricity		1,811.94
Saving in installation of pumping motor (house and foundation)		186.16
*Increase in oil production due to quick change to pumping equipment		1,305.00
Total saving per well drilled		$2,577.67

*These figures are based on oil at $3.50 per barrel. Will change with value of oil.

Chicago, Ill. FIELD EDITOR ELECTRICAL WORLD.

Mechanical Problems in Auxiliary Motor Drives

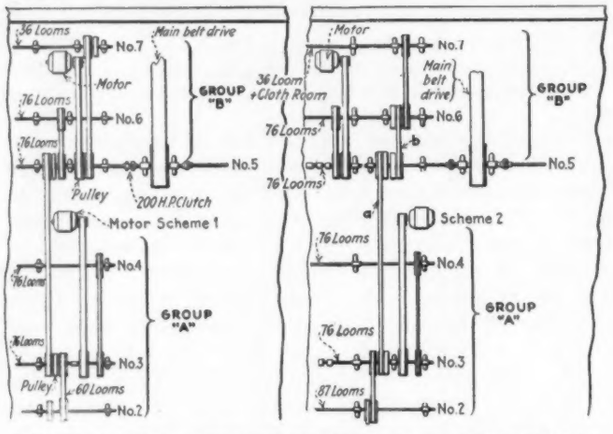
IT IS an old story that it often becomes desirable, especially in textile plants, to operate a small part of the machinery at times when the rest of the factory is shut down. For instance, in a cotton mill equipped with automatic looms it is possible to make quite a labor saving by running these looms unattended during the noon hour or after closing time until they automatically stop because of broken threads or empty magazines. Or perhaps a change in styles slows up certain links in the chain of manufacture, which calls for overtime work on that particular part of the process. In an electrically-driven mill using purchased power such partial overtime production is a simple matter, but in the mill mechanically-driven from one or more large steam engines it is a very expensive thing, since it means the turning over of a large prime mover and driving hundreds of feet of shafting and belts in parts of plant where no work is being done.

The solution of this problem, of course, lies in the purchase of auxiliary electric power to operate the machines which the mill owner desires to run overtime. The installation of such an auxiliary drive is, however, not always a simple matter, since it is necessary to provide for quick changes back to steam drive and from steam drive back again to motor drive.

Experience of this company has shown that the master mechanics of most textile mills prefer tight and loose pulleys to clutches, but if a clutch must be used, a positive-jaw type of clutch is chosen rather than a friction type. The accompanying layouts show two schemes out of several recently submitted for caring for an auxiliary drive for automatic looms in a cotton mill, scheme No. 1 using both a clutch and a loose pulley and scheme No. 2 using loose pulleys only. The very obvious and simple method of using one 150-hp. motor and one clutch only was not considered, as it

was not thought desirable to install so large a unit in this particular case. (The tendency toward more and smaller units is very marked in textile circles.)

It will be noted that in both schemes, when the plant is under mechanical drive, motor belts are left on and motors are allowed to turn over idle. This practice is condemned by some engineers, but has been used in this locality for years with good success; motors, of course, always being alternating-current. There are



TWO PLANS FOR AUXILIARY MOTOR DRIVE IN MECHANICALLY DRIVEN TEXTILE MILL

Scheme 1 has a main clutch and loose pulleys. In Group A one 75-hp. motor drives shafts 1 (not shown) and 2, 3 and 4. When on engine drive motor switch is open and motor is turned over idle. When motor is driving, belts on 3 and 5 are shifted to loose pulleys before engine is stopped and before motor switch is thrown. In group B a 75-hp. motor drives shafts 5, 6 and 7. When on engine drive clutch in shaft 5 is engaged and motor runs idle with switch open. When on motor drive clutch is opened before motor switch is closed.

Scheme 2 employs loose pulleys but no clutch. In group A a 75-hp. motor drives shafts 1 (not shown) and 2, 3 and 4. When on engine drive motor switch is opened and motor turns over idle. Belt (a) is on the tight pulleys. When on motor drive belt on shafts 3 and 5 is shifted to loose pulley before engine is stopped and before motor switch is thrown. In group B a 75-hp. motor drives shafts 5, 6 and 7. When on engine drive belt (b) is shifted to tight pulleys and motor runs idle with switch open. On electric drive belt (b) is shifted to loose pulley before engine is stopped and before motor switch is thrown on.

two objections to this method: first, that it causes unnecessary wear on the motor bearings, and, second, that it is quite possible with careless handling to make the motor try to drive the entire mill, because of forgetfulness in opening clutches or throwing belts to loose pulleys. In practice neither objection has been of any importance. However, if desired, a wide-face pulley can be placed on the motor, driving to a tight and loose pulley on the driven shaft; care, of course, being taken to have the tight pulley line up with the inboard side of the motor pulley.

F. S. ROOT,
Power Engineer.
Fall River Electric Light Co.,
Fall River, Mass.

High Mounting Saves Push Buttons on Grinders

MOUNTING the push-button control for a direct-driven grinding wheel on top of the motor frame has been found by one electrical manufacturer to save the push buttons from unnecessary hard usage. On previous machines these push-button stations were mounted in front of the motor frame, but it was found that the workmen in using these grinders would start the motor by jabbing the button with the material which they intended to grind. With the new position for the button it is easier for a workman to operate it with his hand than with the tool, which naturally prevents misuse.

Small Heat-Treating Furnace with New Elements and Control

TO OVERCOME the objections that have been made to small electric heat-treating furnaces, especially as regards time of heating and flexibility of temperature control, the General Electric Company has recently developed a new type of automatic furnace, known as the semi-cylindrical type. This furnace, which possesses several new and improved features in design and construction, is primarily designed for operation at 1,800 deg. Fahr., although by removing the temperature-limit fuse it can be safely operated at 2,000 deg. Fahr.

It is in the design of the heating element that the most radical departure from former types has been made. The element consists of a continuous strip of resistor ribbon formed into an arch, or succession of semi-circular turns conforming to the arch of the furnace chamber, and extending the whole length thereof, the proper spacing between turns being maintained by insulators. This arrangement gives a strong winding which is self-supporting and still flexible to expansion and contraction. The two ends of the winding are brought out at the back wall of the chamber for attachment to the power supply. The heat is radiated directly to the charge, the absence of a muffle allowing a lower temperature gradient. Furthermore, since the resistor is of large cross section, a high power input for the heating-up period is possible without a burnout.

The heat distribution of the furnace is said to be excellent owing to the spacing of the resistor ribbon, which tends to produce a uniform temperature from the front to the back of the chamber. The manufacturers also claim that it is possible to obtain rapid changes of temperature over the range of from 1,000 deg. to 2,000 deg. Fahr. Another feature is that the whole heating unit may be pulled out bodily for inspection or repair by simply removing the front of the furnace and disconnecting the terminals at the back.

The transformer, which is mounted on the pipe frame of the control board, has four primary coils insulated from the secondary. The coils may be connected in multiple, multiple series or series, for 110, 220 or 440 volts respectively, at 60 cycles. The secondary has two taps, one rated at 70 volts and giving 10 kw. for rapid heating and the other rated at 50 volts and giving 5 kw. for normal operation. A small-capacity extension to the secondary is also provided which supplies 110 volts to the contactor coil and for the motor of the temperature-control instrument. The transformer is rated normally at 7.5 kw., normal, but will give 10 kw. for short periods such as mentioned above, or for one-hour or two-hour periods during the day when it is desired to change the temperature quickly.

The temperature-control instrument on the lower half of the control panel has a scale range of from 1,000 deg. to 2,000 deg. Fahr., so that the furnace is protected from being set at too high a temperature. If for any reason the instrument should fail or become inoperative, further protection is provided by a special fuse which melts at a little above 1,800 deg. Fahr., opening the main-line contactor when it melts and disconnecting the furnace from power supply.

The time required for raising the temperature from cool to 1,560 deg. Fahr. in the morning is 1½ hours when the furnace has been run the previous day and two hours on Monday morning, when the furnace is cold.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

Increasing Electric Sales in Vancouver, B. C.

BY JAMES N. LIGHTBODY
Publicity Manager British Columbia Electric Railway Company

IN ORDER to judge of the results of an energetic advertising campaign to increase the use of electrical energy in residential districts in Vancouver, B. C., the British Columbia Electric Railway Company has analyzed the accounts of a considerable number of its residence consumers, which were carefully selected in order to be representative of the entire residence district. A group of consumers in each block in every section of the district was selected, and without exception an increase in the consumption of energy as compared with the previous year is noted. Ten consumers were taken in each block, and their accounts were averaged for the first six months of 1920 and of 1921. The increases per month were as high as 35 and 45 per cent. The actual consumption per month per consumer ranged as high as 81 kw.-hr. in some sections.

The causes of these increases are the reduction of domestic lighting rates from 8.8 cents net per kilowatt-hour to 6 cents net, the increased sale and use of electrical appliances, an advertising campaign to encourage the use of porch lamps, a gradual abandonment of the popular idea that electricity is costly, and a somewhat increased use of large energy-consuming appliances, particularly electric ranges.

Nearly a year ago the company started a campaign to promote porch lighting. Newspaper advertisements, street-car cards, window cards and a motion-picture film were used. The street-car advertising particularly carried the slogan that a porch light would cost not more than one-sixth of a cent per hour. Capital was made of such incidents as hold-ups on dark streets. The motion-picture film used had no reference to the central-station company, but showed a burglar holding up the resident of a house with no porch lamp. In the next scene the burglar was shown approaching a house with a porch lamp, but was deterred from entering it by the illumination. The slogan "A porch light at night puts the burglars to flight" was effectively used on window cards, electric light bills and in other advertising. The results of this campaign were clearly seen from the start. In nearly every section of the city porch lamps were put into use.

About the same time another slogan was adopted, "The cheapest good thing today is electric current." In the advertising carrying this slogan comparisons were made between the lighting rates in Vancouver and those of other cities. In the fall of this year and the coming winter a series of advertisements will be run still further advertising the fact of cheap electricity. One of these advertisements says that the cost of lighting has dropped 40 per cent since 1917, and another that in Canada only Winnipeg, Ottawa, Fort William, Port Arthur and the cities served with Niagara power have lower rates than Vancouver. These advertisements have a direct effect upon the good will of the public toward the company and in addition do much to remove the idea that electric lighting is expensive.

How a Customer-Ownership Campaign Distributed 5,000 Shares of Stock

AFTER completing the sale of an issue of 5,000 shares of 8 per cent preferred stock to its customers and employees in twenty-two working days, the Adirondack Power & Light Company prepared an interesting analysis of the distribution of the shares among the new stockholders. Stock was sold in nine different cities and towns, a quota being assigned to each based on its size. The issue was oversubscribed 260 shares, and soon after the sale was closed the accompanying "want ad" appeared in a Schenectady paper. It speaks well for the customer-ownership plan of financing and the Adirondack company's method of conducting the sale.

> WANTED TO BUY:
> 50 SHARES
> Adirondack Power & Light Corporation 8 per cent PREFERRED STOCK
> Cash and Immediate Delivery
> Address Box SS, Gazette

A study of the stockholders' list shows that stock was sold to customers representing seventy-six different occupations. Of the company's total of 46,495 customers, 937, or 2 per cent, purchased stock, leaving 98 per cent of the customers as prospective new stockholders of possible future issues, to say nothing of additional sales to present stockholders. The company has 637 employees of whom 228, or 35.8 per cent, became stockholders. The average number of shares purchased per customer was 4.97 and the average per employee was 2.64. The summary shows how the stock was distributed:

Number of customers subscribing	937	
Number of shares purchased		4,657
Number of employees subscribing	228	
Number of shares purchased		603
Stockholders subscribing	7	
Number of shares purchased		87
Total number of customers and employees subscribing and shares purchased	1,172	5,347
Total number of customers, all districts		46,495
Number of customers subscribing		937
Per cent of customers subscribing		2.0
Total number of employees, all districts		637
Number of employees subscribing		228
Per cent of employees subscribing		35.8
Average number of shares purchased per customer		4.97
Average number of shares purchased per employee		2.64
Number of shares purchased for cash		4,679
Number of shares purchased, divided payment		668
Per cent subscribed for on cash basis		87
Per cent subscribed for on divided-payment basis		13

Some Advantages of Advertising the Desire to Serve

BY O. R. TOMAN
Manager Bedford (Iowa) Heat & Power Company

THE good will of the consumer is of more importance today than at any other time in the history of the electrical industry. It will not be obtained by one violent spurt in advertising, nor by mounting a platform and expounding the utility's troubles for hours. Even the doormen would leave.

It has been proved that the American public likes to be served. Not only have the European resorts "cashed in" on this fact, but it is being learned here every day. To convince the consumer that the utilities are his servants, not only today but every day, is the principal task. At times this may be rather unpleasant, but the venture will produce results not even anticipated. The value of good and continuous service is constantly discussed today from many points of view. It is not only necessary that we shall show the consumer that we are giving good service, but also that we convey to him our desire to serve him even more. A few lines in a regular advertising schedule will convey this idea more forcibly than a letter which may or may not be read.

If the power of the press were measured by a meter, there is no doubt the pointer would indicate the maximum figure. This makes the association of the industry and the press one of utmost importance. Informing the press of new problems, of contemplated extensions or of work which is under way has often materially aided in obtaining the good will of the consumer.

To tell the consumer in time of trouble that there is a short circuit means very little to him. He is interested, however, in knowing how long the current will be off and why it is off. In such cases the assistance of the telephone company is invaluable. Giving a little more information to the operator will often enable her to answer the incessant inquiries and permit the officials to devote their attention to restoring service.

In a word, if we are to prosper, it is necessary to convince the consumer that we are his servants and ready to serve him.

Kilowatt-Hour Sales Growing Despite Quiet Business

IN CURRENT advertisements the Union Electric Light & Power Company of St. Louis announces increased sales of electricity regardless of the quietness of industrial enterprises. The increase for the first six months of 1921 over the corresponding period of 1920 is about 3 per cent, and industrial power represents a very large portion of the company's load. The monthly comparison of kilowatt-hour sales is:

	1920	1921	Increase
January	34,534,314	35,046,080	511,666
February	32,616,506	32,608,284	*7,222
March	33,918,499	35,172,123	1,153,624
April	33,008,078	35,054,439	2,046,361
May	34,272,994	34,901,053	628,059
June	33,943,756	34,733,577	789,821
July	32,728,483	34,655,017	1,826,534
Total	235,022,630	242,170,573	7,147,943

* Decrease, as February, 1920, had one more day than February, 1921. Average daily sales in February, 1921, were greater than in February, 1920.

The advertisements state that "this growth represents an average monthly net gain of 1,000 new customers and a steady increase in the average monthly use of energy per customer. Increase of customers has been obtained by energetic sales effort, aided by the constantly increasing desire of everybody to enjoy the money-saving, labor-saving and time-saving benefits of electric service. Increase in average monthly use of electrical energy per customer is mainly due, we believe, to the fact that the generation which regarded electric service with its old-time high rates as a luxury has been followed by a generation which regards electric service with the low rates of today as an indispensable necessity."

From Here and There

Lewiston, Me.—During the month of August the Central Maine Power Company conducted a sale of vacuum cleaners which proved highly satisfactory. In the first three weeks of the campaign sales reached a volume of $1,100, comparing favorably with any merchandising activity which the company had undertaken previously. With the closing of the cleaner sale on Aug. 31, a sale of washing machines was launched, and it is expected that at least a hundred washers will be sold in the district during September. R. Rannacher is store manager at Lewiston.

San Francisco, Cal.—The Pacific Gas & Electric Company of California has just completed a series of newspaper advertisements entitled "That the People May Know." The basis for these advertisements was a series of seven short papers on matters vital to the public service in California by W. E. Creed, president of the Pacific Gas & Electric Company. These papers dealt particularly with the problems in the satisfactory solution of which the public service corporations and the public they serve are mutually concerned. They were published in the *Pacific Service Magazine* of the Pacific Gas & Electric Company, and now the entire series of seven articles has been printed in one booklet for distribution to stockholders, employees and the public.

Louisville, Ky.—Robert Montgomery, manager investment department of the Louisville Gas & Electric Company, relates an interesting incident which shows the value of electrical advertising in connection with the sale of stock to customers. Mr. Montgomery said: "A few days ago an old gentleman called on me, opening the conversation with this question: 'Can I lend your company some money at 7 per cent?' I assured him that we could effect such a thing by selling him our bonds, or preferably making him a partner in our business by selling him some stock. He then explained that he had gone to several banks and offered to lend several thousand dollars for an indefinite period, but 4 per cent was the best interest rate offered him, and later that evening, while walking out Fourth Street, he noticed the big 7 per cent on our electric sign and concluded he would see if the electric company wanted to borrow some money. The result was that the old gentleman succeeded in lending his money to us at 7 per cent, the total amount of the sale being more than twice the cost of the advertising."

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generation, Transmission and Distribution

Protection Against Earths.—A. ROTH.—An abstract of an article in the *B. B. C. Mitteilungen*, Vol. 8, page 71, dealing with the effects of grounds, excess pressures due to grounds and double grounds, surges, rise of pressure to ground in the sound phases, protective devices, extinguishing coils, earthing the neutral, limitation of grounding, horn arresters with resistances, roller dischargers with resistances, aluminum cells or electrolytic dischargers, lead-peroxide dischargers, arrangement of protective devices, overhead and cable networks, mixed networks and experiments with extinguishing coils. With intermittent grounds the pressure to ground in some phases of unprotected networks may reach two or three times the line pressure, according to the article. Owing to the arc formed every half-wave, a dangerous pressure may be produced between the turns of winding and may break down the insulation. The extinguishing coils referred to offer the maximum protection against grounds. These are constructed as air-cooled, oil-insulated transformers. Under certain conditions direct grounding of the neutral can reduce the pressure rise in sound phases to the line pressure. This action depends on the ratio of the impedance of the earth transformer and generator to the short-circuit impedance of the whole system. The type of protection to use depends on what type of protection is preferred. For instance, grounds in an overhead system are mostly temporary in character and the complete suppression of the arc is to be aimed at. Cutting out of the faulty section is to be avoided. The opposite holds for a cable network.—London *Electrician*, July 22, 1921.

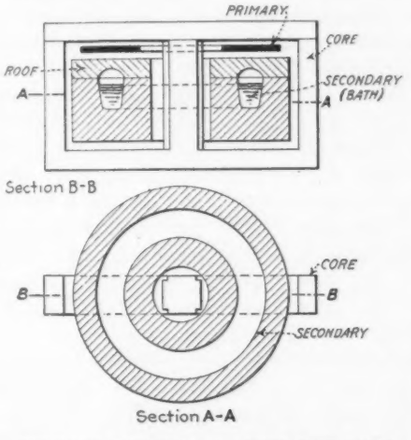
Firing Pulverized Coal.—N. NISHI.—The author deals first with the historical development of the art of burning pulverized coal in the furnace and the present-day tendency in its use. The advantages derived by the use of pulverized coal and the results of actual test are carefully discussed. Later he describes the construction of the more important parts of the pulverized coal plant and compares the relative merit of the various types of plants now in service. The last part of the paper is taken up by the economics of pulverized coal plant and factors to be considered in the selection of the type of plant.—*Journal of Institute of Electrical Engineers of Japan*, July 10, 1921.

London Electricity Inquiry.—The Electricity Commissioners of London are approaching the end of their long inquiry into the organization of electricity supply in the London area. In this report the benefits for East London are outlined, and comments are presented on the functions of the district boards, the expenditures per kilowatt of station capacity, probable interest rates for borrowed money, terms of transfer of companies' stations and the railway companies' schemes. The article concludes with opinions for and against the general plan.—London *Electrician*, July 22, 1921.

Insulation Tests on Live Direct-Current Systems.—G. W. STUBBINGS.—In small central stations or in isolated plants supplying large institutions or industrial works, measuring the resistance of insulation between the ground and the line conductors will determine the condition of all apparatus on the system. One of the simplest tests of this kind consists in connecting to each main of a two-wire system in succession a voltmeter the other terminal of which is connected to ground. By making such tests at different times it may be seen whether the insulation has developed any leaks which were not present in the former tests.—*Beama* (British Electrical and Allied Manufacturers' Association), July, 1921.

Installations, Systems and Appliances

New Type of Induction Electric Furnace.—In the new furnace the primary winding is placed above the crucible and is entirely out of danger in case the metal should leak out of the crucible. The winding is surrounded by a non-magnetic casing which gives mechanical protection and also serves as a guide for the cooling air which is brought in at the bottom of the furnace so as to flow along the center leg of the core and out horizontally over the winding. The winding with its casing is attached to the upper leg or top yoke of the core so that this unit can be detached and removed from the furnace. The combined effect of the electromagnetic forces acting on the bath is as follows: The metallic or current-carrying parts of the bath are forced toward the center of the conductor so that impurities are squeezed out radially. The metal is also repelled toward the bottom of the crucible, causing impurities to rise to the surface. The bath is, furthermore, subjected to circulation, (1) in vertical planes perpendicular to the direction of the current, and (2) in horizontal planes in the direction of current. The former circulation is generally far more pronounced than the latter, which can, however, be increased by tilting the furnace, thus making purposely the cross-section of the bath uniform. One ton of metal may be poured every three and one-half hours with an average energy consumption of 750 kw.-hr. at the furnace and 950 kw.-hr. at the busbars. This includes power for the crane,



PRIMARY WINDING IS ABOVE THE BATH OR SECONDARY CIRCUIT

lights, etc., and losses in the motor-generator set and blowers. When melting down scrap which is in such form that the entire charge of one ton can be put in the furnace at one time, the energy consumption at the busbars is lowered from 950 kw.-hr. to 775 kw.-hr. per ton of metal poured, and the time per heat from three and one-half to two and three-quarter hours.—*Iron Age*, Aug. 11, 1921.

Electrophysics and Magnetism

Electrical Resistance Materials.—WALTER KENNEDY.—Eight of the most commonly used resistance materials in steel plants are considered, such properties as specific resistance, temperature coefficient, permissible working temperature, melting point and mechanical properties involved being given the most attention. A tabulation of data is reproduced here. Temperature coefficient and melting point are the two most important factors in determining the value of resistance. The most satisfactory materials now available for high-temperature work such as 2,000 deg. Fahr. are nickel-chromium alloys, says the author. Cast iron can stand a higher working temperature than either wrought iron or steel on account of its slower oxidation. Owing to its high specific heat, cast iron is very valuable because it can store a lot of heat. To put it another way, for a given temperature cycle cast iron could be worked harder than some other material of higher resistance in which the actual weight of the material would be less.—*Bulletin Association of Iron and Steel Electrical Engineers*, August, 1921.

DATA ON EIGHT MATERIALS USED FOR ELECTRICAL RESISTANCE IN STEEL PLANTS

Material	Composition	Ohms per Circ.mil Foot	Comp. Resistance, Approx.	Temp. Coef.	Working Temp.*	Melting Point
Copper	.....	10.4	1.0	0.00217	500	1,981
Iron wire	.....	60.0	6.0	0.0028	750	2,700
Steel wire	.....	85.0	8.0	.....	....	.....
Cast iron	.....	400.0	38.5	.....	1,000	2,700
Nickel	.....	70.0	6.8	0.004	1,800	2,940
Nickel silver	18% C. Ni.,Zn	200.0	19.2	0.00017	500	1,880
Monel	Copper-nickel	256.0	24.6	0.00400	1,112	2,480
Chromel A	80% N., 20% Cr.	620.0	60.0	0.00006	2,000	3,000

* All temperatures in degrees Fahrenheit.

Kink in the Characteristic of a Soft Three-Electrode Valve.—B. HODGSON and L. S. PALMER.—The kink has been obtained in five types of valves with four different gases. The conditions necessary for obtaining a kink are: First, the valve should be soft; second, the function V_a must be at least the ionizing potential of the gas in the tube; third, the function V_g must be a resonance potential of the gas in the tube; fourth, the resonance potential must exceed in value the minimum potential necessary for the emission of photo-electrons from the material of the grid. The kink is independent of the gas pressure, the valve geometry and the nature of the external circuit.—*Radio Review*, London, July, 1921.

Units, Measurements and Instruments

Current Transformers.—KIYOSHI TAKATSU.—An extensive investigation of the characteristics of instrument transformers which includes forty-one sets of curves. The effect of the interconnection of the secondary circuits of current transformers in a polyphase circuit and the combined errors of meter and instrument transformers are considered under various conditions. A new method of design which will give a definite ratio error and phase angle is outlined. Among other things contained in the investigation were magnetizing and core-loss currents, characteristics under various loads, secondary power factors, secondary impedances and frequencies and the rating of current transformers.—*Researches of Electrotechnical Laboratory* (Tokyo, Japan), No. 95.

Telegraphy, Telephony and Signals

Current Suppression by Means of Parallel Resonance.—H. G. CORDES.—The author considers series and parallel resonance with zero parallel reactance and with zero series reactance and, after giving a numerical example, considers suppression of interfering current in an aërial circuit as well as selectivity and quality of waves.—*Radio Review* (London), July, 1921.

Telephone Service.—An extensive analysis of 208 pages is presented on telephone practices and service. Following the general classification of the telephone service, there are four sections in which the telephone plant and its operation are described. In the first section the developments of the art are arranged approximately in chronological order; the second part contains a description of manually operated equipment; in the third part the three basic systems of automatically operated equipment are described; the fourth part gives a description of outside plant. Next the handling of calls from a quantitative standpoint is considered. Then the elementary characteristics of telephone service are explained in relation to grade of service. A section regarding public relations is included to cover commission regulation of telephone service. A statistical section is appended.—*Circular Bureau of Standards, No. 112.*

Miscellaneous

Electrical Equipment for the Lyndonia Stabilizer.—T. P. KIRKPATRICK and H. C. COLEMAN.—The principal operations of stabilizing a vessel are controlled by two motors, the spinning motor and the precession motor. The operations of starting, stopping and controlling these motors are described and some of the duties performed by the motors are outlined to indicate the characteristics necessary. Attention is directed principally to the construction of the spinning motor and its performance under various conditions.—*Electric Journal*, August, 1921.

Formulas for the Bending of Steel Towers.—A. HEINEMEYER.—A mathematical derivation of several new and simple formulas for the exact calculation of the amount of bending of a steel latticework tower subjected to horizontal pull.—*Elektrotechnische Zeitschrift*, July 28, 1921.

War Work of the Bureau of Standards.—This paper contains descriptions of the investigations and tests conducted by the bureau during the war which were of service to the military department. Photographs illustrating the apparatus used are given in some cases. As no attempt has been made to cover each subject completely, the bureau advises that the various publications issued in connection with the investigations be consulted for more complete data on any particular line of work. Among the subjects which may be of interest to electrical engineers are the following: Electric batteries, electric blasting apparatus, electric tractors and trucks, electric location of metal bodies, illuminating engineering, invisible signaling, magnetic investigation, radio communication, insulated wire and X-rays.—*Bureau of Standards Bulletin No. 46.*

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Sir Robert Hadfield Asks United Effort by English-Speaking Engineers

A MESSAGE to the engineers of this country from Sir Robert Hadfield, the British scientist and engineer, upon whom the John Fritz medal was recently conferred by a mission of thirteen prominent American engineers, has just been made public at the headquarters of the national engineering societies in New York. Sir Robert warmly advocates a "world engineering council of Anglo-Saxons," alluding to the co-operation between Great Britain and the United States along engineering lines in the war and quoting William Ewart Gladstone as a statesman whose principles would go far to solve international difficulties. He also advocates the federation of the engineering societies of the entire British Empire with an executive council similar to the American Engineering Council of the Federated American Engineering Societies. "Engineering," Sir Robert says, "does not lend itself to politics or diplomacy, but engineering of all kinds lends itself to improving human effort and helps on in a very high degree the march of civilization."

The message from Sir Robert Hadfield was prepared in anticipation of the dinner to be given on Oct. 10 at the Engineers' Club in New York in celebration of the return of the delegates who conferred the medal upon him and Eugene Schneider of Paris, as announced in the ELECTRICAL WORLD for Sept. 10, page 533.

Consolidation Project in Indiana Disapproved

THE Public Service Commission of Indiana has denied the petition of the Indiana Electric Corporation for authority to buy seven Indiana public utilities and to issue a total of $12,100,000 in stocks, bonds and notes to finance the purchase, as well as to assume a total of $8,962,000 liens outstanding against two of the selling companies. (See ELECTRICAL WORLD for Aug. 20, page 384.) In denying the petition the commission said that while it was favorably inclined toward the petitioner's project of a centralized power plant in the heart of the Indiana coal field to provide electric power to distant places, if such a project could be made to provide energy at low cost, yet it was of the opinion that such a project could not be carried out along the lines proposed by the petitioner.

Commissioner George M. Barnard, who had charge of the case for the state and who wrote the order, thus summarized the reasons why the commission declined to grant the request:

"The commission is not unmindful of the possible benefits that might accrue to the citizens of the various communities through the establishment of a central generating plant serving the consolidated properties. Under the law, however, any consolidation of utility properties must have a proper basis of value, a proper relation between value and securities and a sufficient annual income to carry proper capital charges. Permitting the consolidation on the basis proposed would have capitalized excessive values against the consumers. This, of course, is improper. The petition was therefore denied."

Otto Kahn Sees Signs of Prosperity Ahead

OTTO H. KAHN, the well-known banker, who has just returned from Europe, was most optimistic on the industrial outlook. "The road lies before us broad and straight," he said, "and if we take it resolutely, refusing to be enticed into byways or alleged short cuts, we shall soon find ourselves within sight again of prosperity and national well being." After some cogent observations on European conditions, Mr. Kahn observed:

"America looms so large as an actual, and still more a potential, factor in world affairs that her domestic affairs form an appropriate subject for discussion in even a cursory survey of world matters. Our own house must be in order before we can be effective in those affairs abroad which are of concern to us. It seems to me that the time has come when we should rouse ourselves out of our slough of industrial despond. And I believe we can do so if we make a determined effort and pull together and follow that road which is marked by the signposts of economic soundness. Some of these signposts are:

"(1) A wise taxation policy. We cannot have a return to normal business conditions, we cannot have vigorous enterprise, until we shall have corrected the most glaring, at least, among the faults of our present system of raising revenue.

"(2) A wise credit and loan policy. There has been too much willingness in certain financial quarters to promote enterprises, to float securities for public sales and to facilitate business expansion when prices were abnormally high and a policy of caution and restriction was indicated.

"In times like the present the attitude of those who are in charge of the business of loans and credits should be one of active encouragement and of a ready willingness, within the limits of prudence and capacity, to extend adequate facilities to borrowers for legitimate needs at home and abroad.

"(3) A wise tariff policy. If we want the foreigner to buy from us, we must be willing that he should also sell to us. Trade in the long run cannot be a one-sided matter of sensational export balances.

"I am in favor of the principle of a protective tariff for America to the extent that its application is necessary to preserve our industries and the American standard of wages and living. But the American standard of wages and living does not and cannot and should not mean that extravagant and wholly fortuitous standard which resulted from the war and from its after-effects.

"In order to use the capacity of our industrial plants and to give full employment to our workers, we must make every effort to hold our own in the markets of the world. And that is only possible if the cost of production can be brought into line with existing conditions. All of us, including labor, will be better off in the long run by getting away from an artificial level which has been of genuine benefit to no one and of considerable harm to a large fraction of our population.

"(4) Sound and effective measures to aid the farming industry.

"Second only to agriculture in national importance is the railroad industry, affecting, as it does, the public at large, the shipper, the investor and many industrial and commercial activities dependent on it to a considerable degree. It is greatly to be hoped that the long-pending settlement between the government and the railroads will at last be consummated without further delay.

"(5) Cultivation of our export trade. That is a difficult task at best. It requires us to protect our thoughts and plans internationally and to establish serviceable affiliations and appropriate co-operation abroad."

Prices of Farm Products Only Business Barometer, Says Douglas

THAT the measure of the country's volume of business and of its commercial welfare in the future is to be found in the demand for farm products and their consequent prices is the opinion of Archer Wall Douglas, chairman of the committee on statistics of the Chamber of Commerce of the United States, as expressed in his monthly review of crop and business conditions. All other barometers can be sent to the scrapheap, Mr. Douglas says.

"Sustained higher prices for cotton mean an amount of business in the South that can come from no other cause," he declares. "Nor does it seem to be likely that there will be that fatal and futile holding of cotton for possibly higher prices that characterized the previous season. The memory of that desperate mistake and its enduring consequences are too recent to bring its repetition."

The improved cotton situation already finds expression not only in a widespread more cheerful feeling in the South but also in somewhat freer buying. This is true likewise in the grain regions, where farmers are liberally marketing hogs, Mr. Douglas says, but he adds: "The commercial world, however, will not reap as much benefit from this as surface indications seem to promise. A very considerable proportion of the money the farmers receive for their products will go to settling the obligations carried over. In some sections when banks and dealers have been satisfied there will not be much left for the farmers for new purchases. Yet when all has been said the situation will be far better than at present."

Purchase Information Bureau Serves New Englanders

TO ENABLE New England electric utilities to keep in closer touch with the prices of power-plant and other supplies, a Bureau of Purchase Information has recently been established at 77 Franklin Street, Boston, in charge of H. L. Ogden of the Massachusetts Lighting Company. At the recent New London convention of the New England Division, N. E. L. A., it was stated that there are now thirty-three members receiving the service of the bureau at a charge of $10 per month each. Bulletins on market prices are issued weekly to members taking the service. At first attention was confined chiefly to prices of coal and fuel oil, but of late various other materials have been added, owing to the increasing inquiries received. Six bulletins had been issued up to the date of the convention, and Vincent Goldthwaite, chairman of the bureau, stated that savings to members had already ranged from $100 to $1,300 in specific cases. One company saved $300 in purchasing two carloads of coke, and in another case the "spread" in price of twin-conductor arc-lighting cable was found to extend from 20 cents to 8 cents per pound.

Utilities Commissioners Convene in Atlanta Next Month

DEFENSE of state railroad and utility regulation against encroachments by the federal government will, according to official announcement, be vigorously maintained by the National Association of Railway and Utilities Commissioners at its thirty-third annual convention, to be held in the roof garden of the Ansley Hotel, Atlanta, Ga., beginning Tuesday, Oct. 11. "Round-table" discussions will be held as in former years. On Oct. 12 the topic will be "After-the-War Phases of Regulation," and E. I. Lewis, formerly a state commissioner of Indiana and now a member of the Interstate Commerce Commission, will be the chairman. On Oct. 13 the important committees on valuation, litigation and state and federal legislation will report. Executive Manager Aylesworth of the National Electric Light Association will speak on Friday.

Carl D. Jackson, chairman Wisconsin Railroad Commission, is chairman of the executive committee of the association, and other committee chairmen are: Public ownership and operation, A. K. Patterson, Alabama; safety of operation of public utility companies, T. W. D. Worthen, New Hampshire; service of public utility companies, W. M. Smith, Michigan; public utility rates, Lewis E. Gettle, Wisconsin; statistics and accounts of public utility companies, O. O. Calderhead, Washington; valuation, H. G. Taylor, Nebraska; capitalization and intercorporate relations, W. A. Prendergast, New York; state and federal legislation, Charles Webster, Iowa; litigation, F. W. Putnam, Minnesota; publication of decisions and orders, James B. Walker, New York.

Indiana Communities Ask Commission for Decreased Utility Rates

NINE Indiana cities and towns have petitions pending before the State Public Service Commission asking for a decrease in the rates of various public utilities. The cases are all separate proceedings brought by the municipal officials with the view of obtaining relief from alleged excessive rates fixed in war time and have no connection with the scores of protests filed by the cities against proposed rate increases initiated in petitions filed by utility corporations.

Many of the community petitions referred to have been filed within the last two or three weeks, indicating, it is said, a concerted movement on the part of municipal officials to obtain reductions in the charges for utility service. Commission officials, it is understood, believe that similar petitions will be filed by other municipalities. The places seeking a reduction of utility rates are in many sections of the state, and the utility corporations affected include electric, gas, telephone and heating companies. Hearing these cases will constitute an important part of the work of the commission this fall.

An analysis of the petitions filed reveals a belief on the part of city officials and consumers generally that the peak in the cost of producing public utility service has long since passed. Most of the rates complained of were established by the commission during the emergency war-time period.

President Harding Summons a National Conference on Non-Employment

WITH Secretary of Commerce Hoover as chairman, a conference called by President Harding will meet in Washington on Monday next, Sept. 26, at 10 a.m., "to inquire into the volume and distribution of unemployment, to advise upon emergency measures that can be properly taken by employers, local authorities and civic bodies, and to consider such measures as would tend to give impulse to the recovery of business and commerce to normal." The President had up to Tuesday received acceptances of his invitation to participate in the conference from thirty-two prominent persons representing producing, manufacturing, industrial and labor interests in all sections of the nation. In addition, twenty prominent economists and statisticians have been formed into an economic advisory committee.

M. S. Sloan Elected President of Edison Association

AT THE concluding session of the convention of the Association of Edison Illuminating Companies held at Spring Lake, N. J., last week, M. S. Sloan, president of the Brooklyn Edison Company, was elected president of the association; John F. Gilchrist, vice-president of the Commonwealth Edison Company of Chicago, was elected vice-president, and W. H. Atkins, general manager of the Edison Electric Illuminating Company of Boston, was elected treasurer. Mr. Sloan has been intimately associated with the electrical industry for a great many years and is chairman of the committee on electrical resources of the nation and of the committee on relations with bankers of the National Electric Light Association.

Utilities Opposing Large Cash Depreciation Fund

THE hearing before the District of Columbia Public Utilities Commission on the proposed rule regulating depreciation and maintenance accounts, which was to have been held on Wednesday of this week, has been postponed indefinitely. The commission proposes to establish a depreciation fund in cash based upon life tables of equipment. From this fund the utilities would be allowed to borrow for extensions, provided that they put up collateral and paid interest to the fund on the amount borrowed.

It is also suggested that in case the earnings of any utility in any month are insufficient to provide for the retirement fund and the financial condition of the utility will not permit of such transfer of cash, a credit corresponding to the amount that should be charged to the retirement fund account shall be made and interest thereon, componuded semi-annually, paid.

The utilities are objecting to these proposals and through the National Electric Light Association are advocating a retirement reserve to take care of recurring retirements rather than the building up of a reserve fund which has no use. All that is asked by the utilities is a fund sufficient to take care of the retirement of property when it occurs with sufficient surplus to iron out any considerable unevenness in the operating expense charged to this item. They oppose crediting into the retirement fund any money not earned because of insufficient rates. They take the position that money for the fund must come from the consumers and not from the utility.

Toledo $13,500,000 Bond Issue Goes on 7.33 Basis

THE $13,500,000 7 per cent first mortgage gold bond issue of the Toledo Edison Company, due 1941, was greatly oversubscribed at 96½, to yield 7.33 per cent. This company has but recently been organized as a merger of the light and power business of the former Toledo Railways & Light Company and the Acme Power Company. This price of 7.33 per cent was considered very low by financial interests and is said to be a very good indication of the strengthening of the utility securities market. There was later issued $2,500,000 of the 8 per cent cumulative series A prior preferred stock of the company at 98, yielding 8.15 per cent.

An issue of $750,000 of 7 per cent gold notes, series A, due 1925, of the El Paso (Tex.) Electric Company came out this week at 96¾, yielding 8 per cent.

Manufacturers Again Producing Electric Ship Equipment for Navy

ELECTRICAL manufacturers are again going ahead on production of electric propulsion machinery for the navy, although no payment can be expected before the next fiscal year, which starts July 1, 1922.

George E. Emmons, in charge of manufacturing of the General Electric Company, has stated that the Navy Department has authorized the resumption of work on electrical equipment for one battle cruiser, with the understanding, however, that shipment will not be required until the next summer and that no payment for materials or labor will be made until the next government fiscal year.

While this necessitates that the company lock up capital for materials and labor until next July, it is going ahead with the work in order to provide employment for those who otherwise would be out of work during the coming winter.

"When the resumption of work is fully under way," said Mr. Emmons, "about 500 additional hands will have employment. It is hoped that similar arrangements can be made with respect to equipment for another cruiser. If they are, work for still more hands will be provided."

At the office of the Westinghouse Electric & Manufacturing Company it was learned that this company also is going ahead with electric propulsion work on a greatly reduced production.

Carolina Company Still Suffering from Shortage of Water

LAST week the Carolina Power & Light Company was forced again to shut off power to cotton mills owing to low water. This time, however, it was only on Friday and Saturday instead of three days as in the previous week. There had been rains, and it was hoped that as a result it might not be necessary again to curtail service. The rains, however, were light and did not raise the water level to the extent necessary.

Other companies in the Southeast have been running their steam plants in the emergency, but the Carolina Power & Light has been unable to operate its Raleigh plant. Formal request for permission to operate this plant was refused by the Raleigh city officials, on account of the scarcity of water.

New York Merchants' Association Opposes Ford Offer

A VIGOROUS protest against accepting the offer of Henry Ford for the Muscle Shoals plant has been made to Secretary of War Weeks by the Merchants' Association of New York City. The association takes the stand that the government by letting Mr. Ford have the water-power and nitrate plants at his own figures would be subsidizing him in the production of fertilizer. Among other things the protest of the association declared:

It is the firm conviction of this association, reached after long and intimate study of the subject, that under no circumstances is the government justified in invading the industrial field, either directly or by means of a subsidy to a single interest under conditions which will give it a great competitive advantage over other private capital.

We believe, therefore, that the Ford proposal should be rejected, both on financial grounds and because it covers in effect a huge subsidy to the Ford interests of a nature seriously destructive to the development of industrial chemistry in this country, and particularly to the production of an increased supply of nitrates, necessary both for military protection and agricultural development.

Northwest Electrical League to Stage Electrical Show

THE Northwest Electrical League has arranged for an electrical show to be held in Tacoma, Wash., on Sept. 28 to Oct. 1 inclusive. The league has been very active since its organization was perfected less than a year ago and is doing much to bring about better relations and closer co-operation between contractors, manufacturers and dealers, as well as to educate the public.

The present electrical show is the first one of the kind to be held in Tacoma and among the first in the Northwest. As an exhibition room the league has obtained the use of the new city warehouse which has just been completed at the corner of Twenty-fourth and Holgate Streets.

Another Offer Made for Muscle Shoals

AN OFFER has been made for the Muscle Shoals plants to the Secretary of War by C. E. James of Chattanooga, who was associated with the Brady interests in the Hale's Bar hydro-electric development on the Tennessee River. Mr. James also asks permission, if his proposal is accepted, to build a high dam for power and storage in the Clinch River at some point near Kingston, Tenn., so as to increase the flow of water at Muscle Shoals and also to take care of distribution losses and to make service more regular between Muscle Shoals and Kingston.

Mr. James' offer is as follows:

First—I will pay for the general plants, land and material at Muscle Shoals, Sheffield, Ala., $5,000,000.

Second—For rent of Wilson Dam and Dam No. 3, I will pay the following amounts for a ninety-seven-year lease: $1 per annum for average horsepower first year, $1.50 second year, $2 third year, $2.50 fourth year, $3 fifth year, $3.50 sixth year, $4.50 seventh year, $5.50 eighth year, $6.50 ninth year and thereafter. All taxes on government property and equipment to be paid by the government.

I would not ask the government to guarantee any specified amount of power. I would want it to put in electric equipment capable of producing 400,000 hp.

If the government put in additional dams above Muscle Shoals in the Tennessee River to aid navigation all the way to Chattanooga, to a boating stage of 9 ft. and 6 ft., Chattanooga to Knoxville, the horsepower would run to 800,000 at Muscle Shoals. If so, the government would receive rental on 800,000 hp., the government to have the right to equip the plant to 800,000 hp. if it decided to do so—I to take the increased power as produced at above rates.

The concrete foundations in dams ought to be made capable of installing a total of 800,000 hp. in machinery, but I would install only 400,000 hp. now, the government to have free 300 hp. to operate lock gates.

I would operate nitrate plants for fertilizers on a basis of 8 per cent profit and keep in good condition Plant No. 2, subject to being turned over to the government in case of emergency.

Ford's Muscle Shoals Estimates Too Low

THE Secretary of War conferred on Sept. 19 with W. B. Mayo and Col. J. W. Worthington, engineers representing Henry Ford, with regard to the Muscle Shoals development. Secretary Weeks said later that the estimates of Mr. Ford's engineers and of the army engineers disagree as to the amount required to complete the work. The Ford estimate is $28,000,000 and the army estimate $58,000,000. These estimates, Secretary Weeks has indicated, must be reconciled before any action can be taken.

Secretary Weeks said that he had asked Mr. Ford's engineers for the details of their plan for converting the nitrate plant into a fertilizer factory. These data are to be worked up and will be supplied, the engineers stated, at a later date. Assurance was given Secretary Weeks, he said, that Mr. Ford had no intention of requiring a guarantee of the government for a definite minimum horsepower.

Before leaving for Detroit to review their estimates Mr. Ford's engineers told the correspondent of the ELECTRICAL WORLD that Mr. Ford will go to Washington to discuss the matter personally with Secretary Weeks at the proper time.

Oklahoma Avoids Issuing Interference Rules for the Present

THE Corporation Commission of Oklahoma will soon issue an order making effective regulations governing overhead construction but eliminating any mandatory order affecting inductive interference. The order is the result of co-operative work between all the interests concerned. The commission had issued a tentative order containing the Illinois overhead-construction rules and the California inductive-interference rules, both in nearly complete form. A committee representing the electric light and power, telephone, steam railroad, electric railroad and gas and oil pipe-line companies was appointed in August to consider the matter, and on Sept. 13 at a formal hearing it recommended that those portions of the National Electrical Safety Code dealing with overhead construction and maintenance be adopted with the addition of a few general rules and that no specific rules for inductive interference be considered until such time as the joint study of the National Electric Light Association and the American Telephone & Telegraph Company shall be completed. After some minor amendments to the committee suggestions had been made the report was unanimously approved by all the interests concerned. Chairman Russell of the commission made a statement complimenting the utility companies on their willingness to co-operate and stating that the report of the committee would be adopted as the order of the commission.

Nebraska Men Told Freight Rates Prevent Coal Cost Relief

PRICES lower and supply ample but relief in total cost not apparent as yet because of the high freight rates was the summary of the coal situation in Nebraska given in the address of President Harvey before the Nebraska Section of the National Electric Light Association at Omaha Thursday and Friday of last week. Contracts can now be made with a provision for adjustments to lower levels as the current market prices fall because of the reduction of labor and other mining costs. Loads on the Nebraska central stations have been steadily increasing, according to President Harvey, as that territory has been less affected by the industrial slump than most others.

DELEGATES AT CONVENTION OF NEBRASKA SECTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION

The inductive-interference committee report brought out a discussion on co-operative work between the telephone and power interests in which President Patten of the Northwestern Bell Telephone Company emphasized the country-wide nature of the service that the telephone companies are aiming to give and made a plea for co-operative work and agreements that will keep the different utilities friendly without the necessity of surrendering any rights to satisfy unreasonable demands. The need of looking forward to the ultimate development of both services was dwelt upon. C. J. Snyder, chairman of the inductive-interference committee, President Bump and Executive Manager Aylesworth discussed the activities of the joint committee representing the power and telephone interests, while Dr. M. G. Lloyd of the Bureau of Standards told of the action of the Oklahoma Corporation Commission a few days before in substituting the safety code for the construction rules previously proposed and leaving the interference situation to be settled after the results of the national co-operative work shall be complete.

The rural service committee, through Chairman F. H. Brooks, submitted a report that embodied the last report of the Wisconsin Electrical Association committee. A. J. Cole in discussing this report called for efforts to educate the farmer in the proper and economical use of electricity and spoke of the reduction in price of energy per kilowatt-hour that might be brought about by increased use for farm purposes. N. T. Wilcox urged the central-station companies not to underestimate the cost of the service or its value to the farmer.

That the electric range properly selected, installed and maintained is the best method of developing good will was asserted by K. P. Goewey in discussing the sale and service of electric ranges. Ranges should not be scattered over the widest possible territory. On the contrary, Mr. Goewey recommended that definite sections of company territory be selected and each section saturated before work is begun on the next, in order that the greatest possible benefit from the diversity factor may be derived. This course was also recommended by F. S. Dewey of the Kansas City Power & Light Company, who asserted that the diversity factor so far fonud was approximately five and not ten.

The Thursday sessions included discussions on practical lighting for the home and store and a consideration by George A. Lee, an attorney of Omaha and former chairman of the Washington State Public Utilities Commission, of the recent trend of court and commission decisions on rates and valuation. The change from no interference with municipal control over rates to denial of such control, the allowance as proper practice of the requirement of consumers' deposits, the reversal of early holdings that utilities were not entitled to expect any return on investment and other similar findings were cited as indicating an awakening on the part of the courts to the real situation.

The officers elected for the coming year were: President, W. B. Roberts, Omaha; vice-president, J. E. Harsh, Lincoln; secretary, Horace M. Davis, Lincoln.

New York Commission Enunciates Radical Policy on Utility Earnings

ACLEW to the general attitude that the new Public Service Commission of New York State is likely to assume as between the proponents and the opponents of the liberal treatment of public utilities in the matter of allowed earnings was in some degree provided last week when Chairman William A. Prendergast handed down a unanimous opinion of the commission denying to the New York State Railways Company permission to increase its street-car fares in the city of Utica from 6 cents to 10 cents, this being the first fare-increase case of importance to be decided by the commission. Holding that the war-time emergency had subsided and that the advance from 5 cents to 6 cents already conceded by the local authorities had not been proved inadequate, the commission summarized its position in these words:

"Public utilities, just as other departments of business, must expect to cope with periods of depression and short earnings, just as at other times they enjoy periods of prosperity and full dividends. If the public is expected to make up every deficiency in order to give a utility a good round rate of earning power, then the public is entitled to the benefit of the surplus over the agreed earning rate in times of prosperity."

Intermountain Conventions Advocate Complete Frankness with Public

ESTABLISHMENT of an absolute understanding on the part of the consuming public of the problems of the electric utility companies was the keynote of the combined annual convention of the Rocky Mountain Geographic Division of the National Electric Light Association, the Colorado Electric Light, Power and Railway Association and the Accounting Section of the National Electric Light Association, held at Glenwood Springs, Col., beginning Monday, Sept. 19. The meetings were attended by 150 delegates.

The problem of inductive interference and similar subjects of general interest to electrical men received the attention of the telephone, telegraph and electric light and power company delegates. Tax-free securities and kindred evils of the financial world were emphasized and the relationship of these problems to financing the electric utility companies was dwelt on.

The delegates were officially welcomed to Glenwood Springs by Mayor W. G. McDonald. President C. A. Semrad of the Colorado Electric Light, Power and Railway Association spoke briefly on the work accomplished by his organization during the last year and made suggestions relative to possibilities for the future. S. E. Doane, chief engineer National Lamp Works of the General Electric Company, Cleveland, gave an address of more than ordinary interest on electric illumination, predicting lighting developments that would eclipse anything done in the past. The national financial situation was brought forcibly before the convention by Frank N. Briggs, president of the Interstate Trust Company of Denver.

The first afternoon session was entirely devoted to the National Electric Light Association. E. A. Phinney, president of the Rocky Mountain Division, who is president of the Jefferson County Power & Light Company, Golden, Col., gave a résumé of the last year's work. M. R. Bump, president of the N. E. L. A., recounted in detail the problems confronting the electric industry and the plans for financing local power companies. The plans of the association are exceedingly comprehensive in scope, as it is the intention that the consuming public shall be fully informed regarding the exact condition of its activities. Ben S. Read, president of the Mountain States Telephone & Telegraph Company spoke of the necessity of utilities having the good will and entire confidence of the public.

When the consumers are told the truth about the public utilities serving them, then will come an understanding of mutual helpfulness and a desire by the public to assume part of the burdens of operation, according to M. H. Aylesworth, executive manager N. E. L. A., who addressed the opening session of the second day.

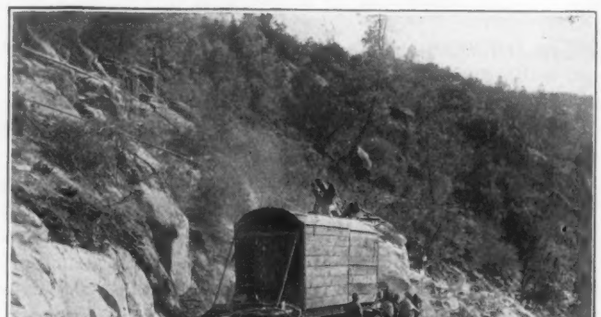
F. C. Hamilton, rate expert of New York City, emphasized the necessity of thoroughly explaining to consumers all the innermost details of a company's operations. "How to Reverse Radical Sentiment" was the subject of an address by Fred R. Marvin, editor of the *Mountain States Banker* of Denver. Latest developments in street-lighting equipment were discussed by L. A. S. Wood of the Westinghouse Electric & Manufacturing Company. Grant E. Halderman, chairman of the Colorado Public Utilities Commission, and S. W. Bishop, executive manager of the Denver Electrical Co-operative League, also made addresses.

The meetings of the last day were given over to business and to hearing of the work done by the National Accounting Section of the N. E. L. A. through E. J. Fowler, the chairman, who is the statistician of the Commonwealth Edison Company of Chicago.

The officers of the Colorado association elected for the year 1921-1922 are: President, Fred Norcross, Greeley; first vice-president, Walter F. Brown, Denver; second vice-president, C. R. Rudy, Denver; secretary-treasurer, Miss Minnie B. W. Baker, Denver. The Rocky Mountain Division of the N. E. L. A. elected as officers: President, T. O. Kennedy, general superintendent Denver Gas & Electric Light Company, Denver; first vice-president, E. P. Bacon, Natrona Power Company, Casper, Wyo.; second vice-president, Arthur Prager, general manager Albuquerque Gas & Electric Company, Albuquerque, N. M.; third vice-president, D. C. McClure, electrical superintendent Denver Gas & Electric Light Company, Denver; secretary-treasurer, A. C. Cornell, manager Intermountain District Western Electric Company, Denver.

Southern California Edison Company to Start 150,000-Kw. Station

PRELIMINARY surveys have been completed and actual work is to be started immediately by the Southern California Edison Company upon the construction of a hydro-electric station which is to have



STEAM SHOVEL STARTING ROAD INTO BIG CREEK NO. 3 SITE

an ultimate rating of 150,000 kw. This station, Big Creek No. 3, will be the fourth plant in the Big Creek development. It will be the second to be built directly upon the main stream of the San Joaquin River, the first being the recently completed 22,500-kw. station known as Big Creek No. 8. At the tailrace of No. 8 station a forebay of 700 acre-feet capacity will be constructed. From this the water will be taken to No. 3 station through 30,000 ft. of 23-ft. tunnel having a capacity of 3,000 second-feet. The maximum static head will be 825 ft. The station will ultimately have six units of 25,000-kw. capacity each, and the output of these is to be stepped up to 220,000 volts through 50,000-kva. transformer banks. The estimated cost of the development up to the first three units is $12,989,000. It is planned to place the first unit in operation in the spring of 1923, the second in 1923 and the third in 1924.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Big Gain in Pacific N. E. L. A. Membership.—It is announced that membership in the Pacific Coast Geographic Division of the National Electric Light Association increased in the fiscal year 1920-1921 no less than 42 per cent. The report of the membership committee, of which R. A. Balzari is chairman, showed 883 new memberships, of which 814 are in class B.

Ontario Town Prefers Utility Electric Service to Control by Hydro Commission.—Cornwall, Ontario, a town of about 7,000 people, has by popular vote extended for ten years the franchise of the local electric utility, the Stormont Electric & Power Company, thus negativing a proposed arrangement fathered by Sir Adam Beck of the Hydro-Electric Commission of Ontario, by which the town would have discontinued the service of the utility and purchased its electricity from the commission.

Icelandic Electricity.—Reykjavik, the capital of Iceland, is rejoicing in the opening of a new electric power house, which is supplying the town with energy at a lower rate than was formerly paid. There are two water-driven generators, one rated at 1,000 hp. and the other at 500 hp. Two water-power companies are established in the island, one under Danish and the other under Norwegian control. Together they are said to own millions of potential horsepower which could be easily produced were there a market for it.

Electrical Progress in China. — The Westernized city of Shanghai naturally stands in the forefront of Chinese communities from the point of view of electrical developments. In 1920 sales of 144,540,000 kw.-hr. were reported by the municipal electrical engineer as against 102,338,000 kw.-hr. in 1919. Of the former amount 117,000,000 kw.-hr. was consumed for industrial purposes, or about 47 per cent more than in the previous year. All former records were surpassed, an accomplishment largely due to the connection of many new factories. The load factor was 46.7 per cent, which the London *Electrician* compares with 25.28 per cent in Manchester and 25.54 per cent in Glasgow, the only two British communities which exceed Shanghai in industrial load. Heating and cooking load in Shanghai advanced 30 per cent in 1920 and reached a total of 1,240,136 kw.-hr. The tendency to discard steam for electric drive is, the British Chamber of Commerce at Shanghai reports, evident in other districts of the Celestial Republic, and the demand for electric lighting constantly grows.

British Electrical Engineers Get Royal Charter.—A "royal charter" recently granted by the British Privy Council to the Institution of Electrical Engineers gives to that body increased power and an enhanced status along the lines of preventing incompetent persons assuming the title of electrical engineer and also of enforcing rules of professional conduct and promoting the standardization of work and material. Previously, the institution, operating under the companies act, was greatly hampered in such respects, and it had long sought to obtain a charter.

Drought in Virginia Affects Supply of Electrical Energy.—A summer-long drought in some sections of Virginia had its effect not only on the water supply of the towns but also on the supply of electricity to consumers. At Fredericksburg, for instance, the Rappahannock River was said to be lower than for seventy years, and no water went over the dam of the Spottsylvania Power Company for several days. A number of industrial plants had to suspend operations, street lighting was restricted, and the energy available went to operate the city's water plant, a creamery plant and ice factories. At Danville, owing to low water in the Dan River, the condensing apparatus in the municipal steam-electric plant worked so badly because of the low vacuum that an excessive consumption of coal was forced.

Bureau of Standards Develops New Test for Purity of Gold.—Spectroscopic experts in the Bureau of Standards have perfected a method of testing gold which will be used in the national mints in addition to the familiar assayer's furnace. It is based on the knowledge that every metal or other element gives off light rays unlike those of any other, and it will, the bureau says, prove much more accurate than the old method, detecting impurities as small as 0.000001 per cent, whereas by the assay process there may remain undetected impurities as large as 0.0002 per cent. Analysis by the spark spectrum method will be faster and less expensive than by the assay method. The bureau experts have made up samples of gold that contain known and varying amounts of impurities, and duplicate sets of the samples have been tested. These samples will become standards. In making them a specially refined gold was needed. The "1000 fine" gold of the mint, which is its highest grade, was found to be only 99.997 per cent pure, while the gold used in the samples was 99.999 per cent pure. The routine process of testing, which can be repeated many times in a single day, will consist in clamping two pieces close together and allowing a spark to play across with a potential difference of several thousand volts. A diffraction grating will be used to break up the light that the spark creates, and a permanent record of it will be made on an ordinary photographic plate that can be compared with photographs of the standard samples.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Electric Club of Chicago.—The opening fall meeting of the Electric Club of Chicago took place on Tuesday, Sept. 20, at 12.15 p.m., at the Hotel Morrison, the business meeting being followed by a musical and vaudeville entertainment.

Vancouver Electric Club.—Officers elected by the Vancouver (B. C.) Electric Club for the current year are: President, E. E. Walker; vice-president, H. Pim; secretary, J. Lightbody; treasurer, F. W. MacNeill. The directors are H. R. Smith, C. K. Dunbar, J. R. Reid, B. Crann, J. Churchland, W. E. Dawson, C. C. Carter and J. D. Ormsby.

N. E. L. A. Committee Meetings.—This week meetings of the Technical Section of the National Electric Light Association have been held in St. Louis from Monday to Friday inclusive. Next week further meetings of this section are scheduled to be held at the Hotel Utah, Salt Lake City as follows: Sept. 26 and 27, sub-groups of the meter, inductive-interference and underground-systems committees; Sept. 28 and 29, dual groups of the overhead-systems and hydraulic-power committees and sub-group of the electrical apparatus committee; Sept. 29 and 30, sub-groups of the safety rules and prime movers committees. The Commercial National Section will hold these meetings in Rochester, N. Y.: Sept. 26, Power Sales, Electric Vehicle and Merchandise Sales Bureaus; Sept. 27, Advertising and Publicity Service Bureau, education committee, Lighting Sales Bureau, committees on commercial service and relations with customers, "Electrical Salesman's Handbook" and electrically equipped furniture; Sept. 28, executive committee.

Coming Meetings of Electrical and Other Technical Societies

Illuminating Engineering Society—Rochester, N. Y., Sept. 26-29. (For program see issue of Aug. 13, page 336.)

National Safety Council — Boston, Sept. 26-30. (For program see issue of Sept. 17, page 582.)

American Electrochemical Society — Lake Placid Club, N. Y., Sept. 29-Oct. 1.

A. I. and S. E. E., Philadelphia Section—Philadelphia, Oct. 1.

American Electric Railway Association—Atlantic City, N. J., Oct. 3-7.

Indiana State Association of Electrical Contractors and Dealers — Indianapolis, Oct. 5 and 6.

Empire State Gas and Electric Association —Lake Placid, N. Y., Oct. 6 and 7.

National Association of Railway and Utilities Commissioners—Atlanta, Ga., Oct. 11-14.

N. E. L. A., Southeastern Section—Chattanooga, Tenn., Oct. 17-19.

Electrical Supply Jobbers' Association, Atlantic Division—Philadelphia, Oct. 20.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Proper Operation of Municipal Plant.—In a hearing of complaints by customers of the municipal electric plant of Butler, Mo., the Missouri Public Service Commission held (1) that the cost of changing from direct-current to alternating-current meters was properly placed upon the customers, (2) that it was reasonable to refuse to take on new customers during this change of service, (3) that the proper official's permission was rightly held requisite before individual service wires could be connected with the system, (4) that a cash deposit or a guarantee from a responsible person was properly required before the installation of service, but (5) that demands for service from taxpayers should be met immediately upon their compliance with the company's reasonable rules and regulations.

Discrimination Involved in Constructing Extra Cable to Refrigerating Plant at Electric Service Company's Expense.—The cost of installing an extra cable to supply energy to a refrigerating plant in case of breakdown should be borne by the refrigerating company, according to the Missouri Public Service Commission, the cost of only one cable being properly chargeable to the central-station company. Otherwise there would be discrimination against other companies which might also require breakdown service but to whose plants only one cable had been carried. This was the outcome of a complaint brought against the Union Electric Light & Power Company by the St. Louis Refrigerating & Cold Storage Company because of the refusal of the former to extend two cables to the refrigeration plant

Proper Treatment of Income Tax.—In discussing the operating expenses of an electric utility recently, the Wisconsin Railroad Commission said: "As to the income tax, methods of procedure differ. Some authorities treat it as an operating expense and others handle it as a deduction from net income. In either case the final result is unchanged. The utility under normal conditions is entitled to a fair return. If from the net income which makes up such return income taxes are deducted, the remainder must still be sufficient to be compensatory to capital or the return will be insufficient to permit of the development of the industry. In making an allowance of 8 per cent for return the commission considers such allowance necessary after meeting all tax requirements. We have endeavored to compute the normal tax on the assumption that the utility will earn a fair return."

Company Has Right to Refuse Service Where Equipment Is Not Standard.—The Board of Public Utilities Commissioners of New Jersey denied an application for an order to compel central-station service which had been refused because the would-be customer had installed a switch box and safety cabinet which did not conform with the rules of the company. The commission pointed out that the primary objects of standardization are the development of the best appliance for the purpose intended, safety, reduced cost of installation and reduced cost of operation and maintenance, and while a variance in some particulars might be held to be immaterial and the company's action in refusing service unreasonable, still specifications for standardization purposes must necessarily be more or less arbitrary, and in the case under review the company's refusal was justified especially by variations in the size of the equipment.

Basis of Rates to Be Charged Electric Light and Power Company for Energy from Irrigation District.—The California Railroad Commission in a decision approving an agreement entered into between the Merced Irrigation District and the San Joaquin Light & Power Corporation has fixed 4.5 mills a killowatt-hour at the plant switchboard as the price the power utility is to pay the district for electric power to be developed by the district at its proposed plant at Exchequer, Mariposa County. With cost of transmission, including loss of energy, this figure is found comparable to the price of the exchange by the power companies of electrical energy at substations. In arriving at the plant switchboard rate the commission adopted the principle that the value of the power should be measured by the average estimated cost of future developments of stream-flow plants to be constructed by power companies. Average cost of present power development based on pre-war and war prices of plant construction was adopted as the best index of future costs, and according to opinions of the electrical engineers of the commission the price of 4.5 mills, plant switchboard measurement, should not be subject to future variation. Owing to the rapid growth of the San Joaquin Light & Power Corporation the commission found it would have no difficulty in absorbing this additional power. The Merced Irrigation District plans the development of electric power as a by-product of its irrigation system, by which it contemplates the storage of 250,000 acre-feet by a dam across the Merced River, near Exchequer, 25 miles northeast of Merced. At the price fixed for the 25,000-kw. capacity of the proposed plant, the commission estimated the gross revenue at $450,000 a year. An allowance of $190,000 for operating expenses and fixed charges on the power plant will leave $260,000 available to reduce the annual charges on the irrigation district for water development.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Temporary Rates May Be Ordered Pending Investigation.—The rate-making power of the Oklahoma Corporation Commission is not limited to any particular theory or method, declared the Supreme Court of Oklahoma in a suit brought by the city of Bartlesville against the commission to prohibit it from authorizing an increase in gas rates, and the commission may, if it has the necessary facts before it, prescribe a temporary schedule of rates to be effective until it has had time to make an investigation and a valuation of the public utility's property. The state's sovereign interest in the regulation of rates precludes the cities of the state from entering this field by charter provisions or otherwise. (199 Pac. 396).*

Contract Between Municipality and Public Utilities Company Not Subject to Review by Ohio Commission.—The Ohio Supreme Court, in Link vs. Public Utilities Commission, has sustained the commission in its refusal to take jurisdiction of a complaint filed with it, pursuant to statute, by more than 2 per cent of the electors of Cleveland against the contract rates made for steam and hot-water service by the Cleveland Electric Illuminating Company. A contract, the court holds, entered into by the passage of an ordinance fixing the rates and terms of a designated product and service for a specified period and by the duly filed written acceptance thereof by the company cannot, under the Ohio constitution, be reviewed by the commission. (131 N. E. 796.)

Incorrect Statement to Workman that Lines Are Not Charged Is Negligence—"Casual" Employment.—In a case (Porter vs. Mapleton Electric Light Company) where a workman was severely burned by wires on which he was working and which his superior had told him were not charged, a clear instance of negligence on the part of the company was established, according to the Supreme Court of Iowa. The victim of the accident, being a lineman of the telephone company temporarily "loaned" to the electric light company, came under the category of a "casual" employee of the latter company and, having been injured by its negligence, was entitled to sue for damages instead of proceeding under the workmen's compensation law. (183 N. W. 803.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

C. **Ernest Greenwood**, the newly appointed chairman of the Merchandise Sales Bureau, N. E. L. A., is widely known in the central-station field for

C. E. GREENWOOD

his work in the national organization and in the Edison Electric Illuminating Company of Boston, where he is superintendent of the sales department and editor of *Edison Life*, the company's monthly publication for employees. Mr. Greenwood was born in Boston in 1880 and was graduated from Harvard College in 1904. In May, 1906, he entered the electrical industry as a special agent of the Boston Edison company. After about two years' work on the standardization of contracts with customers and other related tasks, he was transferred to the statistical department. This was followed by field service for the sales department, including district agency duties and work on isolated plants. About nine years ago he was made editor of *Edison Life*, which was then being established by the company on broader foundations, and his faithful service to this periodical in the midst of other tasks of increasing responsibility has been a potent factor in its high reputation as a company publication. Since 1916 he has been at the head of the appliance department, the activities of which include the promotion and sale of socket devices throughout the company's territory of more than 600 square miles. During the last five years Mr. Greenwood has been very active in association committee work. He was a member of the electric range committee for three years and has been chairman of the committees on electric shop management and of merchandise sales of the Merchandise Sales Bureau, as well as chairman of the New England N. E. L. A. Commercial Section, president of the Boston Edison Company Section of the N. E. L. A., and for the last two years vice-chairman of the Merchandise Sales Bureau. He has also served as treasurer of the Edison Employees' Club. He is a member of the Engineers' and Harvard Clubs of Boston and of the Hunnewell Club of Newton.

Prof. Harold J. Lockwood has resigned as instructor in physics, electrical engineering and other subjects at Lafayette College, Easton, Pa., to become professor of electrical engineering at the Thayer School of Civil Engineering, Dartmouth College, Hanover, N. H.

Joseph F. Becker, who has been appointed chairman of a new N. E. L. A. committee to promote electrically equipped furniture, is sales manager of the United Electric Light & Power Company of New York City, which position he has held since 1910. Previous to that he was associated with the Brooklyn Edison Company. His first connection with that company was in 1898 as meterman. From that post he rose rapidly to superintendent of the meter department, later being appointed general agent for the company, which position he held until he accepted his present appointment. Mr. Becker's activities in the N. E. L. A.

J. F. BECKER

are well known. He was chairman of the Commercial Section in 1916. He has also been closely identified with the activities of the Sales Managers' Association and was chairman of that organization in 1917.

James T. Hutchings, who recently resigned as president and general manager of the Rochester Gas & Electric Company to become assistant general manager of the United Gas Improvement Company of Philadelphia, has been appointed general manager of that company. Mr. Hutchings was associated with the Rochester Railway & Light Company from June, 1904, to April, 1920, advancing from the position of superintendent of the electrical department to general manager, vice-president and president. During this sixteen-year period he was largely responsible for the physical growth of

J. T. HUTCHINGS

the Rochester company. Previous to his Rochester association Mr. Hutchings was associated with the Philadelphia Electric Company and before that with the Germantown (Pa.) Electric Light Company as assistant superintendent in 1890. He was born in Amherst, Mass., on Feb. 18, 1869, and was graduated from the Massachusetts Agricultural College at that place in 1889.

Charles F. Backstrand, until recently assistant district manager of the Holton Power Company, El Centro, Cal., is now associated with Howard F. Ross in the Riverdale (Cal.) Electric Company.

Frank M. Tait and Mrs. Tait are receiving messages of sympathy from their many friends owing to the death of their only child Frank M. Tait, Jr., on Sept. 17. Mr. Tait is now associated with the Anthony Brady estate and is well known in the electrical industry, having served as president of the N. E. L. A.

F. R. Winders, electrical engineer of the Railroad Commission of Wisconsin, has obtained a three months' leave of absence in order to assist the joint committee of all Ohio utilities working on the compilation of rules for overhead-line construction to comply with state regulations requiring the Ohio Public Utilities Commission to put such rules in effect not later than six months from Aug. 1, 1921.

H. S. Cooper has resigned as secretary of the Southwestern Electrical and Gas Association, to take effect as soon as a successor can be selected, after which he expects to take a much-needed rest. Mr. Cooper has been secretary of the association for the past nine years

H. S. COOPER

and has earned for himself the reputation of having made the Southwestern association of unusual value to the member companies and of making the meetings extremely interesting. He was one of those who started the association back in 1904, having been president of it and always active in its development even before he became secretary. Before becoming secretary of the association he had been engaged for a number of years in the Southwest in utility and engineering work. In addition to his association duties he has for the past six years been engaged in the practice of consulting engineering in the utility field. Mr. Cooper was born in 1856 and at the age of twenty engaged in the manufacture of agricultural equipment in the South, shortly afterward entering the electrical field. In 1893 he was appointed manager of the Schenectady (N. Y.) properties of the Electric Development Company, and after placing the electric lighting, gas and railway utilities there on a paying basis he directed the rehabilitation of the Ithaca (N. Y.) Railway. He later joined the staff of the Development Company of New York City, preparing critical reports on electrical projects for clients. In 1904 he became general manager of the Galveston City Railway, continuing until 1910 with that company's successor, the Galveston Electric Company. At that time he was retained to supervise the design and construction of the Galvez Hotel at Galveston. In 1912 he became secretary of the Southwestern Gas & Electric Association.

E. D. Kilburn, vice-president and general manager of the Westinghouse Electric International Company, has left New York for a trip to Mexico. While there Mr. Kilburn will make a survey of general business conditions. He looks forward to considerable expansion in the electrical industry in that country.

F. W. Burmeister of the fan sales department of the Robbins & Myers Company has been appointed assistant sales manager of the fan department.

W. Wilder, formerly of the Steel & Tube Company of America and the Allis-Chalmers Company, has become associated with the Elliott Company of Pittsburgh, and will make his headquarters at its Pittsburgh office, covering surrounding territory in the interest of the products manufactured by that company with special regard to promoting the sale of Elliott-Ehrhart condensers.

Daniel R. W. Murdock, who has been made chairman of the new Radio Section of the Associated Manufacturers of Electrical Supplies, is a partner in the long-established house of the William J. Murdock Company, Chelsea, Mass., manufacturer of electrical specialties and producer of telephone and radio apparatus. Mr. Murdock was born thirty-nine years ago at Charlestown, Mass., and after receiving instruction in the Boston schools entered the manufacturing field at Boston in close association with his elder brother, William J. Murdock, founder of the organization above mentioned. In 1900 the firm moved from Boston to Chelsea, and about 1904 it enlarged its production facilities to include radio apparatus. After a period of factory experience Mr. Murdock began to devote his attention to sales work, and he now has charge of that branch of the business. He is also the company's treasurer. The organization of sales offices at San

D. R. W. MURDOCK

Francisco and New York has been carried out by him in this connection. He is a member of the Institute of Radio Engineers of America and the Radio Club of America.

Obituary

Silas C. Linbarger, ceramic engineer for the Carborundum Company, died Sept. 10 at his home in Niagara Falls, N. Y. He had been with the Carborundum Company since December, 1915.

Horace M. Briggs, for twenty-four years in the power engineering sales service of the Edison Electric Illuminating Company of Boston, died at his home near that city Sept. 6 after a brief illness. Mr. Briggs was born at Canton, Mass., in 1853 and as a young man was employed by the Gold & Stock Ticker Telegraph Company of New York in the line and trouble handling departments. After a term of employment in various electrical manufacturing and sales organizations, Mr. Briggs joined the commercial department of the Boston Electric Light Company, and he continued with the Boston Edison Company when the two utilities were consolidated. Mr. Briggs had much to do with the commercial engineering problems involved in the substitution of central-station for isolated-plant service in the Boston territory and will be kindly remembered by a very large group of electrical men in eastern Massachusetts utility circles.

Charles W. Davis, vice-president and general sales manager of the Standard Underground Cable Company, Pittsburgh, Pa., died Sunday, Sept. 11, in the Memorial Hospital, New York. He had been in failing health for several years and had gone to New York for special medical treatment. Mr. Davis was born in Pittsburgh forty-eight years ago and was educated at the Western University of Pennsylvania, now the University of Pittsburgh, and at the Massachusetts Institute of Technology. His connection with the Standard Underground Cable Company begun shortly after his graduation from college, or about 1899, at which time he was employed by the company as construction engineer on a large cable installation in Mexico City. Later he became superintendent of construction and manager of the central sales department, continuing in these positions until 1915, when he was elected vice-president in charge of the general sales, construction and accessories departments. Mr. Davis was well known in the electrical industry as an expert on the design, manufacture and installation of electric cables and acessories, and had contributed largely to the development of the art by his investigations and occasional technical papers and by his many inventions dealing with improvements in methods of cable construction, installation and operation. He was a member of the American Institute of Electrical Engineers, the Pittsburgh Club, the Edgeworth Club and the Allegheny Country Club of Sewickley, Pa.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Wire Producers to Furnish Statistics to Department of Commerce

REPRESENTATIVES of thirty-four bare and insulated copper-wire manufacturers met at the Hotel Commodore, New York, on Sept. 13 to discuss the advisability of asking the Department of Commerce to include wire production statistics in its "Monthly Survey of Current Business." The meeting was called at the suggestion of L. S. Horner, vice-president of the Acme Wire Company, who presided.

About two-thirds of those present voted to furnish the necessary figures, three objected, and the rest preferred to defer decision until they had had more time to consider the matter. Prior to the meeting Mr. Horner received from a few wire manufacturers who could not be represented letters commending the idea of the meeting. There was every assurance at the meeting that, provided the Department of Commerce would collect, tabulate and print such wire statistics, at least 60 per cent of the copper-wire producers of the country would be represented at the very outset.

W. M. Steuart, director of the Department of Commerce, who is director of the survey, was present and described the department's plan and method of working. Statistics are furnished at the department's request. These are tabulated and printed monthly, and individual reports are kept entirely confidential.

Wire manufacture divides itself naturally into four groups —bare, rubber-covered, weatherproof and magnet. For each of these it has been proposed to gather monthly statistics on production, stocks and shipments. The definite form of report which the manufacturers will recommend to the Department of Commerce is now under consideration by a committee composed of H. D. Keresey, Anaconda Copper Mining Company, representing the bare-wire group; Edward Sawyer, Atlantic Insulated Wire Company, representing the rubber-covered wire group; L. S. Horner, Acme Wire Company, representing the magnet-wire group and W. F. Field, Phillips Wire Company, representing the weatherproof-wire group. This committee of four selected LeRoy Clark, Safety Insulated Wire & Cable Company, as chairman.

Two Sizes of Ceiling Fans Felt to Cover Requirements

FAN manufacturers are satisfied that there should be two standardized sizes of ceiling fans, it was brought out at the Hot Springs convention of the Fan Motor Section of the A. M. E. S., held early this month. Heretofore it was thought that the fan with 56-in. sweep would satisfy all demands that would be made for this type of ceiling fan. It is true that there are sizes a few inches under and a few inches above this figure that are still being made, but the tendency in manufacture is decidedly toward this 56-in. size, which has been set as a standard for this type of fan. The factor of cost of change-over is said to be holding up complete compliance with the standard at this time.

It is felt that there is a need for a ceiling fan with 40-in. sweep, or just under this figure, and the manufacturers represented at the meeting have decided to go into this matter and determine on a size which will best suit the requirements. A maximum of 40 in. is thought to be enough. The demand for this size comes particularly from the Southern territory, where smaller rooms and narrower halls and passageways than are found in other parts of the country have been a deciding factor in the use of ceiling fans. No standard has been determined upon, but it is expected that in the near future the result of experiments by manufacturers will point the way to the size best suited.

Higher Steel-Sheet Base Does Not Affect Electrical Sheets

TOWARD the end of last week most of the prominent independent manufacturers of sheets advanced their prices $5 per ton. Black sheets went from 2.75 cents to 3 cents, galvanized from 3.75 cents to 4 cents, and blue annealed from 2.25 cents to 2.5 cents per pound, Pittsburgh base. Considerable booking was done before the old price was cleared off the boards. At this time of writing the leading sheet producer has not made any advance in price to the new bases taken by the independents.

As far as can be learned, there has been no advance in electrical steel sheets for magnetic use. This market is still quiet, although it is reported better than it was in the early summer. Under this condition it is considered unlikely that a higher price will be placed on it at this time unless it reacts in that direction through the influence of the general sheet market.

Electric Furnace Market Good in Some Quarters

WITH the generally recognized low volume of operation of the steel and iron mills and also of the brass mills throughout the months of this year to date, it would not be surprising to find the electric furnace industry on a rather low basis also. To an extent and in some quarters this is the case, but, on the other hand, certain manufacturers of this equipment report a satisfactory volume of business in both ferrous and non-ferrous furnaces throughout the past spring and summer.

The condition of the steel mills and brass mills has generally been considered to act as a barometer for the electric furnace market. With steel and iron mills operating this year at around 10 to 20 per cent of capacity and many of them shut down for rather long periods, the ferrous furnace business did not flourish in its entirety. Some steel plants took that slack time to rehabilitate their properties and to put in more economical methods of steel production, and certain furnace makers picked up some good business. As this business was limited this summer, it is to be expected that reports should be received showing from several sources rather a quiet market.

The important factor to consider at this time, it would seem, is the returning activity of the steel mills. Furnace manufacturers report a great number of inquiries for installations, showing that the steel mills are alive to the fact that a higher-quality product is being demanded and a lower price is being sought by the trade. Considering this fact of quality and price, the manufacturers are looking forward to a very strong market in the future, which should show some signs of life this fall In some quarters of this industry a turn toward better business was noticed in July.

A return of business in general seems to be the awaited signal that will start off a good number of steel mills in

the actual purchase of electric furnaces. They already have their figures on costs and installation. At the present time steel ingot production has increased to about 33 per cent of capacity, whereas in July it was about 21 per cent. This in itself is indication of a returning market. One manufacturer feels that economies of production rule the market when he says: "A properly designed, ruggedly constructed electric furnace for brass, aluminum, gray iron or steel is an economically correct implement for competitive production of high-class metal, and consequently at the present time, when competition is keen in all metal trades, should receive remarkable attention from all industries employing melting apparatus."

The export market is one which also gives promise of a bright future. Canada and some of the European nations stand out quite prominently in this respect.

School Installations Providing Field for Lighting Fixtures

ONE of the most promising markets in the lighting fixture field at present would appear to be that of lighting fixtures for school buildings. Reports have recently been received from several sections of the country showing activity in that direction in various local instances. The field seems to be peculiarly fitted for the application of unit lighting fixtures, and certain manufacturers have been putting the situation squarely up to local contractors to go out and sell the equipment.

One manufacturer of unit lighting fixtures attributes the demand for school lighting equipment both to a normal increase in population, necessitating additional school facilities each succeeding year, and to the lack of building activity during the last five years, both factors combining to create an actual shortage of school facilities. Because of high construction charges new facilities are not in all cases being provided, and this is leading to longer school periods in the day and even to night classes. At the same time additional advantages are being offered for night school work through organizations not directly affiliated with the educational institutions, and this is requiring the use of more room for night periods. In addition, unused portions of buildings are being put to use for educational classes.

With the coming of shorter days and the increasing use of educational buildings during periods when artificial illumination is necessary it would seem that manufacturers and distributers of suitable lighting equipment should bend additional efforts in this direction through local electrical contractors.

Iron Conduit Reduced in Price Nearly 7 per Cent

RIGID iron conduit reacted to a further price drop on Sept. 16. Card 48 was issued as of that date, placing discounts four points higher. In carload lots ½-in. black now takes 45 per cent and ½-in. white takes 39 per cent discount. These figures are the same as those issued under date of Feb. 15, 1917, showing pipe to be back to where it was four and one-half years ago. Meanwhile the discounts have been reduced to a low figure of 21 per cent—a record high price in May, 1917, since which time they have tended upward to the present figure.

General Electric Orders at the Rate of Approximately $180,000,000

IN A LETTER to the stockholders of the General Electric Company, dated Aug. 27, Charles A. Coffin, chairman of the board of directors of that company, states that the yearly rate of orders received for the first thirty-three weeks in 1921 is $180,440,000. Following this statement, it was officially pointed out to a representative of the ELECTRICAL WORLD that orders to date are approximately at this same figure. Considering the fact that business placed with this company during the successive weeks of this year has been in general on a downward trend, present conditions seem to indicate that buying is again on a slightly upward curve.

The apparatus market, it was pointed out, is the one uncertain market today. Financing of public utilities through the seven months of this year to date has amounted to over $346,500,000, of which nearly 85 per cent is new capital and the remainder is for refunding. The utilities have been especially successful in the marketing of these securities to such an extent that virtually the entire issues have been taken up. It would appear from this that the central-station companies have the money in hand for expansion, but that so far very little of it is going into new electrical apparatus and equipment. It was brought out that manufacturing capacity on this electrical equipment will not be in excess when the utilities again enter the market to fill their apparatus and equipment needs, in many cases quite pressing.

Electrical Materials Little Affected by Higher Cotton Prices

WITH the higher cotton prices which have been holding quite steadily for the past two weeks at just around 20 cents a pound, there has been some inquiry as to whether or not certain electrical materials containing cotton have reacted to higher levels or are liable to go there in the near future. So far as can be learned, there has been no advance in general. The exceptions found are in flat insulations. Certain woven white tapes have been marked up 4 per cent, and one brand of sheet varnished cambric is reported 15 per cent higher. No change was noted in varnished cambric tape, insulated wires and cables or nonmetallic flexible conduit. Local reports of higher prices on loom and insulated wire are undoubtedly the result of local conditions in distributing channels

Metal Market Situation

COPPER is holding its position as far as the price is concerned, although demand is quite light. There are some orders coming through, it is true, but the tonnages are small. Producers are sitting tight on 12.25 cents per pound, delivered for September, but in some quarters this price is being extended into the first half of October. The outside market is a trifle easier, and quotations here are about on the basis of 12.25 cents delivered, a slight recession since last week. Export prices f.a.s. New York are 12.12½ cents for electrolytic, but the demand is for copper nearer 12 cents.

Another advance in price of lead was announced on Sept. 20 by the American Smelting & Refining Company. This was a five-point jump, bringing the New York price to 4.65 cents. Producers and outside markets are reported well sold up for several weeks under a well-distributed demand. The zinc market continues its slight improvement.

NEW YORK METAL MARKET PRICES

	Sept. 13, 1921	Sept. 20, 1921
Copper	£ s d	£ s d
London, standard spot	68 17 6	67 15 0
	Cents per Pound	Cents per Pound
Prime Lake	12.25	12.25
Electrolytic	12.25	12.25
Casting	11.75	11.75
Wire base	13.50	13.75
Lead, Am. S. & R. Co. price	4.60	4.65
Antimony	4.45	4.45
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	10.00	10.00
Zinc, spot	4.70	4.67½
Tin, Straits	26.75	26.50
Aluminum, 98 to 99 per cent	24.50	24.50

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	9.50 — 10.00	9.62½ — 10.12½
Brass, heavy	4.50 — 4.75	4.75 — 5.00
Brass, light	3.75 — 4.00	4.00 — 4.25
Lead, heavy	3.37½ — 3.50	3.37½ — 3.62½
Zinc, old scrap	2.00 — 2.37½	2.00 — 2.37½

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for all Eastern Points

AS A WHOLE a slow, steady improvement in buying on the part of the contracting and jobbing trades is reported this week. Emphasis is laid on absence of speed and the condition is regarded as healthy. Wiring materials are moving better in such sections as those tributary to New York, Boston, Chicago, St. Louis and Atlanta, and appliances seem to have taken a new lease of life in those districts. The Northwest reports a satisfactory recovery in business and in tone and, with excellent wheat and apple crops reported, trade recovery is expected to be even greater in the fall. The Intermountain region is expecting a better recovery through government agricultural loans now in progress of allotment.

In the Southeastern States the cotton prices are stimulating sales of all commodities, especially in rural districts. St. Louis jobbers are, it appears, getting a better net profit than they were a few months ago.

Lower prices are shown in rigid conduit and higher prices in knobs and tubes and in some cotton tapes and sheet varnished cambric.

NEW YORK

Conditions in the electrical trade continue to improve, and the general impression among the jobbers is that the low point is definitely passed and a steady but gradual recovery is under way. An encouraging sign is the increase not only in the number but in the size of individual orders received by jobbers. Contractors and dealers appear to have more confidence and to a limited extent are replenishing their depleted stocks of wiring material. Several sales of conduit in carload lots to contractors have been made, and one jobber reports the sale of 100,000 ft. of flexible armored conductor to a contractor who expressed the belief that present prices are at the bottom. The demand for wiring material of all kinds has increased, not to such an extent as to cause any shortage, but it has shown a gradual and healthy improvement.

Collections remain about as last reported. Except for that class of outstanding accounts which are chronically slow, collections are running thirty to sixty days. With the increased activity in the trade electrical credit men are watching the opening of new accounts very carefully.

Conduit.—Announcement by the manufacturers of new discounts on conduit which became effective last week has lowered the price on the larger sizes. Jobbers' prices are quoted under the new discount as follows: For ½ in. black pipe in 2,500 ft. lots, $54.75; ¾ in., $70.79, and 1 in., $101.42 per 1,000 ft. Galvanized pipe in the same sizes is quoted at $59.59, $77.34 and $111.11 per 1,000 ft. Demand continues to be fair and a few sales of carload lots have been reported. Stocks are good in most sizes.

Flexible Armored Conductor.—Buying of flexible conductor continues steadily, and there are indications of a general belief that prices this week have touched bottom. No. 14, two-wire, single-strip is quoted at $43 per 1,000 ft. in lots of that quantity, and double strip at $44.50 per 1,000 ft. Jobbers' stocks are fair to good.

Rubber Covered Wire.—Recent strength in copper quotations has tended to steady the price of wire. No. 14 rubber covered in 5,000-ft. lots is quoted at $6 to $6.25 per 1,000 ft. Demand shows little improvement and buying is all of a hand-to-mouth nature. Jobbers' stocks are good and in some cases large.

Metal Molding.—No price changes are reported this week. The three-wire size is quoted at $5.60 per 100 ft. in 1,000 ft. lots. Demand is fair and stocks as a rule are small.

Loom.—The relative small demand for this material in this territory keeps stocks low. Although cotton has increased, no change has been announced in the quotations on loom. The 7/32-in. size is quoted at $19.25 and $19.80 and the 1/4-in. size at $21 to $21.60 per 1,000 ft. in 1,000 ft. lots.

Heating Appliances.—These devices are moving better than at any time during the summer, but no orders for holiday trade have appeared. Dealers seem to be reluctant to put in stocks of any appliances but those which afford a quick turnover. Jobbers state that there is still a shortage of some makes of flatirons and also a scarcity of curling irons. Stocks of other appliances, while sufficient to meet current demand, are not large.

Porcelain.—Effective Sept. 12, prices on porcelain knobs and tubes were increased in price about 25 per cent. The discounts were lowered 5 points.

CHICAGO

Some improvement has been noted in the past week by jobbers and by manufacturers, who report a considerable increase in inquiries of all sorts though orders continue to lag behind. The inquiries include almost the whole line of contractors' supplies and indicate that interest in construction is awakening in spite of the fact that not much actual work is being started. Retail buying sustains the improvement noted last week, with sales of washing machines, vacuum cleaners and ironers holding up fairly well.

The building boom which in some quarters was confidently expected to follow the Landis decision has struck an unexpected snag in the failures of several groups of workers to abide by the award and the refusal of the arbitrator to grant a rehearing while the men are on strike. The steel market locally has relapsed into a state of coma following the recent flurry of railroad buying, which failed to last. To counteract this outlook there has been a noticeable upturn in agricultural lines, as shown by the liquidation of excessive loans by country banks.

Wire.—The market is firmer, with quotations ranging from a 15-cent to a 15½-cent base for bare wire. Inquiries have increased and a few good orders are reported. The movement of rubber-covered wire is slow and No. 14 may be obtained in 2,500-ft. quantities at $6 per 1,000 ft. Weatherproof wire sales are fair and are being made at 16 cents per pound in 1,000-lb. lots

Non-Metallic Flexible Conduit.—There has been little buying and stocks are generally large. The nominal quotation on the 7/32-in size is $18, while the ¼-in is offered at $20. These prices represent a slight reduction.

Rigid Conduit.—Quotations are unstable, a small price decrease being reported by some jobbers while others report no change. This has very little effect on the market as contractors are buying only according to their immediate light requirements. Prices on ½-in. black range from $47 to $49 per 1,000 ft.

Line Material.—Inquiries are brisker on all sorts of line material. The Sanitary District of Chicago is planning to buy, and short extensions in rural territory are being planned by a number of utilities in Illinois, Michigan, Kentucky and Indiana.

Transformers.—Distribution transformers continue to be in moderate demand in territory around Chicago, and jobbers are able to make deliveries out of stock. There is little call for power transformers.

Lamp Cord.—Sales are running along fairly well with a much better demand for the cotton-covered than for the silk-covered. A nominal quotation for No. 18 cotton-twisted is $13 per 1,000 ft.

Schedule Material.—There has been a reduction of from 10 to 15 per cent on schedule material and demand has picked up somewhat. Orders for sockets and ordinary switches are numerous, though individually small, and this demand is expected to hold up all fall. Distributers have succeeded in bringing their stocks down to thirty days.

BOSTON

The volume of trade continues to reflect improvement in many lines of business. Wiring materials moved fairly well last week and a better demand for appliances was seen in some quarters. Jobbers' stocks, while sufficient for current demands, are much smaller than heretofore, and buying from manufacturers is somewhat better. Collections are about the same. Labor conditions are quiet this week, with some improvement reported in regard to employment. The textile and leather industries are holding their own in New England, and some specialty manufacturers are busier. Electric railway net earnings are improving and telephone traffic in New England is growing with leaps and bounds. Central-station outputs are holding up well and wiring contractors are busy on many jobs of moderate size. A sharp increase in porcelain prices was a feature of the week's activities.

Wire.—Better movement is reported, although orders of moderate size are common. Bare copper wire is dull, with base at 13⅝ cents and ample stocks. Weatherproof is selling fairly well around 15 cents per pound, and so far no advance has been reported on account of stiffening cotton prices. Rubber-covered wire is in larger call owing to more active building operations. No. 14 in 5,000-ft. lots sells nominally at $6.25 per 1,000 ft., but on substantially larger orders under close competition prices ranging between $6 and $5.75 are not uncommon. Stocks of wire are still large, and the pressure to unload is strong.

Knobs and Tubes.—Prices moved upward last week about 25 to 35 per cent on these products and buying is more active. Representative prices now in effect are as follows on tubes: 5/16-in.x3-in., $6.20 per 1,000 in barrel lots. Six-inch tubes are moving at $13.50 per 1,000 in barrel lots. "Nail-it" knobs bring $18.50 per 1,000 in barrel lots, and two and three-wire unglazed cleats, $14 per 1,000 in barrel lots.

Non-Metallic Flexible Conduit.—With sizable stocks and moderate demand prices are firm. In 1,000-ft. lots the 7/32-in. size moves at $17.50 per 1,000 ft. and the ¼-in size at $20.

Flexible Armored Conductor.—Moderate sales, usually in lots not over 1,000 ft., feature the market. No. 14 single-strip sells around $47 per 1,000 ft. in 1,000-ft. lots. A good many small orders, however, are being handled.

Radiators.—Increased sales are reported and a heavy demand is apparent for a new unit 8 in. in diameter, retailing at $5. A fair movement on radiators listing at $11 and $12 is also evident. Sales to dealers on all these are being made at list less 30 per cent for moderate quantities. The outlook is good for fall trade in this line.

Washers.—Popular interest in electric washers is reflected in a decidedly improved demand.

Portable Lamps.—With the fall season opening, sales are bound to quicken in the next fortnight. Interest has been well developed by good merchandising and prices are attractive, stocks being large and well diversified. The fixture trade is much improved.

Motors.—Orders show continued moderate improvements, especially on integral sizes up to 25 hp. Business is scattered and few groups of motors of any magnitude are included in sales, but interest and actual buying are distinctly better. Prices are firm.

ATLANTA

The continued advance in the price of cotton is having the expected effect in stimulating all lines of trade. The morale of the section has been further improved by the prospect of excellent crops in other lines, and as a result the construction of various long-delayed projects has begun. A number of ice plants and large business buildings are under way, and these, together with home and small commercial construction, have reduced non-employment to a low figure. The improvement in rural districts is reflected in the electrical jobbing trade by a large increase in the number of orders received from the small towns distributing to the rural districts, with trade in the larger cities holding its own. Most of the orders up to date are for construction material and are coming from the small contractors, while small central-station companies and municipal plants are actively undertaking long-delayed maintenance work, causing a brisk demand for line material. The hot weather helps the sale of fans, but at the same time the late fall is causing a delay in the placing of orders for fall and winter stocks. The large banks are offering through their correspondents to make loans on cotton up to 75 per cent of the market price, and this is placing funds in districts that have long been handicapped by the lack of credits.

Condulets.—A reduction of approximately 5 per cent in the price of condulets is noted, but this specialty continues to move slowly. Such orders as are being received emanate largely from industrial plant jobs and therefore should increase in number in the near future. Stocks are large throughout the section.

Non-Metallic Flexible Conduit.—Another slight reduction in price is reported in this line, which continues slow on account of heavy consumers' stocks. Jobbers' and contractors' stocks are in fine shape.

Flexible Armored Conductor.—The market price continues very unstable, prices varying as much as $5 to $7.50 per 1,000 ft. A considerable demand is noted.

Poles.—No further price reductions are reported on poles. Western red cedar and chestnut are reported in considerable demand, the latter showing signs of regaining the popularity it enjoyed several years ago. Most of this material is going to small central-station companies for maintenance work. Stocks are in good shape.

Exhaust Fans.—The season has been somewhat disappointing in this line, sales amounting to 60 per cent of those last year, and a carry-over is inevitable.

Pole-Line Hardware.—The entire line of pole-line hardware is reported to be quite active, with prices on a firm basis for several weeks past. Stocks are considered sufficient to meet the requirements.

Distributing Transformers.—This item has not kept pace with the movement of poles and hardware, thus indicating that the bulk of the two latter items is going for maintenance and not to new construction and extensions. A fair assortment of sizes is to be had from local stocks.

Wire.—The lowest price for several years is noted in No. 12 and No. 14 rubber-covered, No. 12 being offered at $9 and No. 14 at $6.50 per 1,000 ft., though the prices of the larger sizes are more firm. Jobbers are accumulating good stocks in these sizes. The movement of weatherproof wire continues steady.

ST. LOUIS

The commencement of construction of an industrial building in which will be installed about 750 hp. in motors was of outstanding interest here last week, for it was the first industrial construction job of appreciable magnitude that has been started for several months. All indications point to a gradual yet healthy increase in construction work.

The situation in the South as a result of the higher cotton market is being closely studied by St. Louis jobbers. It is probable that the demand for electrical goods will become stronger and that payments will be on a better basis, but so far a very conservative policy it being followed in making sales and extending credits.

As a whole, jobbers here report a slight improvement in business last week and net profits are decidedly better than a few months ago. Appliances are moving more rapidly, particularly vacuum cleaners, washing machines and flatirons. Especially good demand obtains for dry cells. Wiring materials are finding steady call, and schedule materials, largely as a result of recent price reductions, are selling on a substantially better basis. Payments are becoming more regular, yet there are still a large number of long-standing obligations that are being paid but slowly, particularly in the South. Credit conditions in Illinois are reported better than in the other states of this territory.

Wire.—The stiffening of the copper market has not shown its effect in wire prices, No. 14 rubber-covered still selling at $6.10 per 1,000 ft. in 10,000-ft. lots. This is an average price, and quotations are sometimes made 10 cents to 20

cents lower. The base price on both bare and weatherproof remains at 14½ cents per pound. A steady demand, with tendency to improve, is found. The larger sizes of rubber-covered are moving better than they have done for some time. Stocks are in excellent condition.

Dry Cells.—A heavy demand has obtained for dry cells in the last week, one company reporting orders for seven car loads. In a number of instances the stocks are somewhat short. The regular is priced at 31 cents and the igniter at 32 cents, both in barrel lots.

Schedule Material.—Since the recent price reductions there has been a decided increase in demand. Sockets, rosettes and fuses are leading in sales.

Safety Switches.—Entrance switches for residential work are finding some call, but the other lines are very quiet, chiefly because of the lack of industrial building. The demand is expected to improve this fall and winter as manufacturing conditions improve.

Lighting Fixtures.—There is virtually no movement in industrial lighting fixtures of the metal type, but fairly good business is found in the glass fixture. In the latter one jobber reported exceptionally good business last week on account of some school jobs.

Ranges.—The sales in this territory are exceptionally quiet and no special efforts are being made to move them. Stocks are on a conservative basis, and in a number of instances the central-station companies are averse to pushing sales because of limited plant capacity.

Flatirons.—Movement is definitely better and is being aided by the price reductions. Stocks are well in hand. Other heating appliances are moving quite slowly.

Washing Machines.—Better business is reported, largely owing to lower prices which have been established on almost all makes of machines. A rather general reduction of 10 per cent was made on Sept. 1. Further reductions have been temporarily placed on a few lines that are being campaigned.

Motors.—Sales of motors ranging in size from 5 hp. to 50 hp. are showing improvement, and there are an increasing number of inquiries regarding the larger sizes. Fractional sizes are not moving well. A few good sales of motor-generator sets are reported. Jobber stocks are fairly well in hand, but dealer stocks are in a number of cases somewhat heavy.

Air Heaters.—A very conservative buying policy prevails. Stocks were fairly well reduced last season, yet jobbers are placing only small initial orders. No orders from dealers have as yet been received.

SAN FRANCISCO

Business conditions show some improvement, although the return to normal is rather slow. Orders are increasing in size and some substantial stock orders for wiring staples are reported. The general feeling is that it will be next year before really big business returns. Rather early rains threatened some of the late crops, especially raisins, but a timely warning prevented a serious loss.

Sockets.—A 30 per cent reduction in sockets and other schedule material is effective, making the dealers' price on standard packages of ½-in. cap key sockets 18 cents per socket.

Sewing Machines.—Increased activity of sewing machine sales is probably the result of seasonable home-sewing advertising. So far dealers have not solved the question of allowances for exchanged machines, probably because their volume of sales has not yet reached the stage where many of such propositions are encountered. In general it may be said that good stocks are carried by them.

Dishwashers.—The larger mercantile stores are prominently displaying dishwashers and are giving window demonstrations, besides devoting an increased amount of advertising space to their exploitation. A number of "prospects," with a satisfactory amount of sales, are reported.

Ironers.—Although the sale of ironers has suffered along with the sales of the larger socket appliances, it is significant that more and more dealers are appreciating the possibilities of the field and will push their sale when conditions warrant.

SEATTLE—PORTLAND—SPOKANE

Indications show that the Northwest, and especially that territory tributary to Portland, is recovering very quickly and decidedly from the business depression. Buying is limited mostly to necessities, but these are being purchased in large quantities, indicating a much improved condition. The towing business, which is an important index to business conditions in the Puget Sound district, has steadily increased since the first of June. Lumber and grain are moving in good quantities from both the ports of Seattle and Portland. A spirit of optimism prevails in the Spokane district, and it is felt that the worst of the depression has been passed. The most encouraging features of the local situation are the excellent wheat crop and the prospects of a good apple crop. There is little activity in the mines and most of the larger lumber mills have shut down for the winter. Lumber production in 101 mills of western Oregon and Washington was 20 per cent below normal during the past week. In spite of better feeling and improved business conditions throughout the Northwest, there is a large employment problem ahead for the winter, and all of the larger cities have well formulated plans to cope with the situation.

Electrical jobbers of Seattle report business gradually improving, with stocks in good shape and deliveries uniformly good. Portland jobbers report that their stocks have been somewhat depleted in the lines in which most active demands exist, but orders are being placed at once to overcome this condition. Deliveries are good. Spokane jobbers report a large increase in business as the result of price reductions of electrical goods during the last sixty days. One firm reports more business in the last sixty days than during any two months previous this year. Cedar-pole men report many inquiries and some orders. Inquiries are mostly from electric railway companies.

Contractor-dealers of Portland report that construction work appears to be considerably better than in the past. Store sales are not greatly changed, although there is more activity in the sale of lamps. Seattle dealers report that radiant-type heaters are beginning to move.

SALT LAKE CITY—DENVER

Collections in the electrical field are still slow, sixty days being about the average period for settlement. Demand for money is still so strong that banks would be swamped if they granted all or even part of the applications for loans and only the very best secured loans are granted. The general demand for good bond and mortgage investments is unusually strong, indicating that there is not so much a lack of money as a lack of inclination to spend it on the retail market. With prevailing favorable weather the lumber trade is showing steady improvement. Building is confined chiefly to residential subdivisions. The chairman of the War Finance Corporation is just now making a tour of cities in the Intermountain West, allotting loan funds to be available soon to farmers. It is believed that together with liquidated crops the proposed relief will go a long way toward solving agriculture's biggest problem.

Salt Lake City's new "electric home" is now open. The venture is considered to be unusually timely coming at a period of extensive home building.

Vacuum Cleaners.—Jobbers report a slight tendency to overstocks, with dealers showing the usual reluctance to buy in large lots. Dealers advertise unusual payment plans, offering to take as little as $1 as initial payment. Others have premium propositions to stimulate buying.

Air Heaters.—Temperature that is somewhat below the normal average of mid-September is making a better market for air heaters. The demand, however, is scattered and the movement sluggish. Better activity is noted for radiant heaters and a pick-up in sales is reported. For the past week the lowest advertised price was $11.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

"Autovent" New Name for Batterman-Truitt

The Autovent Fan & Blower Company is the name which the Batterman-Truitt Company, 736-738 West Monroe Street, Chicago, has taken since early in September. The company manufactures fans and blowers for ventilating work and it was felt that it would be better to utilize the trade name "Autovent" and have the company name convey the idea of the products of manufacture than to continue with a designation disconnected from the ventilating field. No change was made, it is announced, in executive or sales personnel, nor has there been any in manufacturing or sales policies.

A. M. E. S. Section Meetings for Oct. 5

Announcement is made of the following section meetings of the Associated Manufacturers of Electrical Supplies set for Oct. 5: Heating Appliance Section in the association rooms in New York City; in Pittsburgh, the Outlet Box Section, Cast Box Section, Outlet Box Fittings Section and Switch Box Section.

Electrical Division Collecting Data on Foreign Construction

The new electrical divison of the Department of Commerce has started the collection of information concerning prospective electrical construction abroad. All the available machinery of the Department of Commerce and of the State Department is being utilized in that connection. In this way it is believed that this information can be given to American manufacturers sufficiently in advance to afford them an opportunity to sell the necessary supplies and equipment.

The division also is gathering information with regard to central stations throughout the world. The data in regard to organization, equipment and the system used will be compiled.

It is the opinion of R. A. Lundquist, the head of the division, that never before in the history of the electrical industry have there been in contemplation many projects for railway electrification as there are now. This trend toward electrification of railways has been stimulated by the high price of coal. Among the electrification projects now being considered are:

The Brazilian Central Railway, the Paulista Railway in Brazil, portions of the Chilean state railways, a nitrate railroad at Iquique, Chili; a heavy traffic line in the vicinity of Bombay, India, and also a line running out of Calcutta. Other foreign developments of importance concerning which Mr. Lundquist has gathered some information are the Aberdeen-Laxapana water-power development in Ceylon, the expansion of the Tata hydro-electric system near Bombay and the Mysore, a government scheme in the native state of Mysore.

Perfection Hoist & Engine Company Moves Plant to Two Rivers

The Perfection Hoist & Engine Company, 352 Railway Exchange Building, Chicago, has purchased the plant of the Two Rivers (Wis.) Plating & Manufacturing Company and has moved all of its machinery from Milwaukee to the new plant in Three Rivers. The company manufactures a 1½-kw. unit light and power plant for farms which it will distribute through dealers and distributers, nationally and internationally.

The company also manufactures a mechanical non-hydraulic hoist for dropping trucks. The officers of the company are: George Garens, president; A. P. Schoeffler, vice-president; Walter Mayer, secretary, and F. A. Emmons, sales manager.

Canadian Crocker-Wheeler Purchased by English Electric of Canada, Ltd.

English Electric of Great Britain Forms Subsidiary in Canada to Take Over Manufacture of British and Canadian Electrical Products of Well Established Companies

After many months of investigation, the English Electric Company, Ltd., of Great Britain has decided to enter the Canadian field, and through its associate company, the English Electric Company of Canada, Ltd., which has just been incorporated with main offices in Montreal, Canada, it has purchased the capital stock of the Canadian Crocker-Wheeler Company, Ltd., St. Catharines, Ontario. It was only last week that the final financial details of the purchase and consolidation were effected.

The Canadian Crocker-Wheeler Company, Ltd., was organized in 1910 under the general managership of R. A. Stinson. Mr. Stinson, who was vice-president and general manager of the Canadian Crocker-Wheeler Company, Ltd., will be president and general manager of the new company.

The English Electric Company of Canada, Ltd., is associated with and holds the exclusive manufacturing rights in perpetuity for Canada of the English Electric Company, Ltd., of Great Britain, and will in addition act as the exclusive agency through which all selling, engineering and construction work in Canada will be done. It has the use of all the patents, designs and processes of the English company and also holds the right to sell its products in the United States and Newfoundland. This company, through the purchase of capital stock of the Canadian Crocker-Wheeler, will have the benefit of the entire fixed and current assets and all the patents, designs and processes of that company.

Co-operating actively with the Canadian company will be the research and technical departments of the parent company. The most modern British and Canadian methods of manufacturing will, therefore, be used and all the latest developments be placed at the disposal of the Canadian company. The plant and equipment are of the most modern type. Manufacturing facilities will be extended from time to time to cope with the constantly growing demand for electrical apparatus in the various branches of the industry.

In addition to the Canadian members of the board of directors of the new company there will be three directors of the parent company besides the London advisory committee, which is composed of men of wide engineering and manufacturing experience in Great Britain.

It is understood that the electrical equipment peculiar to the former Canadian Crocker-Wheeler Company, Lt., will be manufactured under that name, while equipment peculiar to the English Electric Company, Ltd., of Great Britain, will be manufactured under that name.

In the report of the Canadian Debentures Corporation, Ltd., Toronto, which offers part of an issue of $2,000,000 of 8 per cent preferred stock of the new Canadian company, it is stated that through its association with the British company this new company will be in a position to import all electrical equipment and supplies not manufactured in Canada from England, thus having the advantage of the preferential tariff and the present favorable exchange rate. The report further states that the earnings of Canadian Crocker-Wheeler for the past five years have been at a rate more than sufficient to pay the dividend charges on the new issue of preferred stock of the English Electric Company of Canada, Ltd.

Wm. J. Murdock Company Opens New York Office

The Wm. J. Murdock Company, Chelsea, Mass., manufacturer of telephone and radio equipment and other electrical specialties, has established a sales office at 1270 Broadway, New York City, in charge of Pearcy W. Mack. Commenting on business conditions last week to a representative of the ELECTRICAL WORLD, one of the company's officials stated that the demand for these products is more active than a year ago and that conditions are favorable for continued active production.

State Manufacturers' Association's National Conference in September

The National Conference of State Manufacturers' Associations has been called for Sept. 29 and 30, to meet at the Congress Hotel in Chicago, to consider the industrial situation, giving special attention to congressional legislation, such as the tariff, taxation and transportation.

The convention has been called at the urgent request of manufacturers generally and manufacturers' associations, with particular reference to pending legislations. Invitations are being extended to manufacturing organizations of the United States anl also to individual manufacturing firms to send representatives and to co-operate.

Every line of manufacturing business will have an opportunity to be heard so far as is possible in a two-day session, the call for the convention states, and at the close of the convention resolutions resulting from the deliberations will be offered for action by the convention. The office of the secretary, John M. Glenn, is 104 South Michigan Avenue, Chicago.

Federal Trade Commission Favors Proper Promotion of Uniform Cost Accounting

The attitude of the Federal Trade Commission toward uniform cost accounting has, it would seem, been clarified in some recent correspondence between Nelson B. Gaskill, acting chairman of the commission, and the fabricated production department of the Chamber of Commerce of the United States. This department of the chamber asked the commission for a statement of its position in regard to the promotion of uniform cost accounting and its use by members of trade associations. In his letter of Aug. 2, Mr. Gaskill further explains a previous letter by saying:

"Stated in another way, the conception of the commission is that the efforts of a trade association to educate the individual member in the application of sound principles of cost accounting in his individual business are proper, but that any subsequent effort of the association to reduce the individual costs to an average or uniform cost basis and to procure the use of the group standard as a basis of price making by each of the individuals in the group is improper. The individual must fix his own cost and his own margin. The group may not attempt to substitute a group average or standard either of cost or margin for the individual's figures without being in peril of becoming an unlawful combination.

"Applying this statement to your interpretation of our letter of the twenty-fifth, it may be said that for a trade association to set up and induce the use by its members of a scientific and accurate plan of cost accounting is not only legal but highly beneficial to the individual members of the association. The use of this legal and highly beneficial information by each individual in establishing his own production cost and determining his own margin is entirely proper. If thereafter the association attempts to induce its members to disregard their own varying figures and use a common average or uniform figure of cost or margin or both, it has departed from its proper position of instructor and may easily take on the appearance of a price-fixing combination in restraint of trade or in suppression of competition."

Employee-Representation Plan Working Well at G. E. Lynn Factory

Further testimony as to the successful operation of the plan of employee representation in use at the Lynn (Mass.) works of the General Electric Company was given recently at the Babson Industrial Conference at Wellesley Hills, Mass., by F. P. Cox, manager of the Federal Street works of the company at Lynn. The general principles of this plan were outlined in the ELECTRICAL WORLD of March 1, 1919, soon after the establishment of the arrangement at Lynn by R. H. Rice, manager of the Lynn works. Mr. Cox said that during the first year of operation of the plan out of 1,200 cases which arose 1,020 were settled without going to any shop committee, and all the remaining cases were settled by one of these committees without going to the manager. In the two and one-half years that the plan has been in force only three cases have gone to the manager, and these three were satisfactorily settled.

Report of Fair Vehicle Charger Business in New York

The Autolectric Devices Corporation 1966 Broadway, New York City, finds its volume of business in connection with the electric truck and the motion-picture field almost as good as it was last year, according to Otto Sarvas, who is in charge at that address. The company handles motor-generator sets and other charging and rectifying equipment for these two fields for replacements, repairs, servicing and new installations. Present business is quite good. Early in the summer Mr. Sarvas took on the exclusive distribution in New York territory for the Westinghouse electric vehicle charger and also distribution of the rectifying equipment of the Acme Electric & Manufacturing Company, Cleveland, in addition to the charging apparatus it was already carrying of the Automatic Electrical Devices Company, Cincinnati.

Tubular Woven Fabric Announces Changes in Organization

The Tubular Woven Fabric Company, Pawtucket, R. I., manufacturer of "Duraduct" and "Duracord," announces the following changes recently made in its organization: P. S. Klees, who has recently been in charge of the New York territory, has been appointed general sales manager of the company, with headquarters at the factory in Pawtucket. Mr. Klees has been connected with the electrical industry for more than twenty years, serving with the Franklin Electric Manufacturing Company and afterward with the Pierce Fuse Company. The New York territory will be divided, with F. W. Brower in charge of the northern half, including New York City, with headquarters at New York, and F. M. MacDuffie in charge of the southern half, with headquarters in Philadelphia. Ernest C. Alcott, who has been connected with the sales department of the company at the factory in Pawtucket, has been given charge of the Michigan and Indiana territory, with headquarters at Detroit.

J. H. Schmidt, Muskogee, Okla., has awarded a contract for the construction of a one-story factory for the manufacture of electric batteries and other electrical equipment, to cost including equipment about $50,000.

The American Electric Service & Maintenance Company, 51-57 Taylor Street, Springfield, Mass., operating a plant for machine and electrical repair work, is making arrangements for the removal of its plant to a new building on Liberty Street, where it will have double the floor space now occupied.

The Northern Equipment Company, Erie, Pa., announces the appointment of the Ernest E. Lee Company, 115 South Dearborn Street, Chicago, as its district representatives for "Copes" boiler-feed regulators and pump governors.

E. G. Bartling announces the removal of his office from the Ford Building to 617 Book Building, Detroit. He has also taken the agency for the Passaic Rubber Company, handling a full line of tape, and for L. D. McFarlan, Sandpoint, Idaho, shipper of red cedar poles.

Automatic Reclosing Circuit Breaker Company, Columbus, Ohio, has established a branch office at 1613 Chestnut Street, Philadelphia, in charge of H. A. Van Dyke.

The Standard Underground Cable Company, Westinghouse Building, Pittsburgh, has awarded contract for a two-story building, 300 ft. x 525 ft., to be erected on Kingshighway and St. Slevin Street, St. Louis. The cost is estimated at about $1,000,000.

Foreign Trade Notes

SCHEME TO SUPPLY ELECTRICITY IN BURMAH, INDIA.—Plans are said to be under way to supply electricity in the town of Insein, Burmah, India.

PROPOSED WATER-POWER DEVELOPMENT IN ALGERIA, AFRICA.—A commission appointed by the Governor-General of Algeria, which has been investigating the development of water power to generate electricity for railways, proposes to utilize the falls of Oued-Agricun, in the Department of Constantine. It is estimated that sufficient power could be developed for the electrification of a railway line from Bougie to Seitif (about 50 miles) and another line from Bougie to Beni-Mancour, a distance of about 57 miles. It is planned to have a special commission study further the matter of electric power on the basis of a three-phase circuit of low frequency.

ELECTRIFICATION OF VADSTENA-FAAGELSTA RAILWAY.—Permission has been granted by the Swedish government for equipping the Vadstena-Faagelsta Railway for electrical operation.

PROPOSED WATER DEVELOPMENT FOR AYR, SCOTLAND. — The proposed scheme for developing the water power of Loch Doon to supply electricity in Ayr, according to *Electrical Industries*, has been recommended by the lighting committee to the Town Council for approval. The cost of the project is estimated at £250,000.

PRIZES FOR ELECTRIFICATION SCHEME OFFERED BY LIEGE, BELGIUM.—In order that the electrification of the province may be most advantageously effected the local government of the province of Liege, Belgium, is considering how best to reorganize the existing and projected generating stations. In order to get assistance in the solution of this problem it is offering four prizes, one of 25,000 francs, one of 15,000 francs and two of 10,000 francs each, for the four best schemes which may be submitted on or before March 1, 1922. Full conditions as to this competition and details of the present position of electricity supply in the province may be obtained from the Governor, Place St. Lambert, Liege, or from the headquarters of the Technical Department, 33 Rue Derchis, Liege.

POWER PLANT FOR TOOWOOMBA, AUSTRALIA, TRAMWAYS.—A revised estimate for a power house and substation for the proposed tramways scheme at Toowoomba, Queensland, Australia, has been submitted by F. A. McCarthy & Company, consulting engineers, to cost £72,700. The City Council has requested the government to instruct an expert to go ahead with the project.

PROPOSED POWER PROJECT FOR LITHGOW, AUSTRALIA. — The Lithgow (New South Wales) Council has been informed by the New South Wales Railway Department that it proposes to establish a large power station in the west part of New South Wales when funds are available. The station will be supplied with coal from the State coal mine at Lithgow.

GENERAL ELECTRIC SERVICE FOR PROVINCE OF ZEELAND, NETHERLANDS.—Arrangements have been made for the installation of a general electric service for the Province of Zeeland, Netherlands. The scheme has been arranged through commissioners of a concern organized as the Namloose Venoopschap Provinciale Zeeuwwijze Electriciteits Matchappy, with a capital of a million florins (normal exchange about $400,000). This has been raised by subscription on the part of seven communities in the province which have taken a small share, the rest of the capital being subscribed by the provincial government. Land has been purchased at Sluiskil for a central station, for which a contract has been awarded. At Henglo a contract for erecting the first high-tension transmission line for a distance of 65 km. has been granted. The cost of the entire electrification of Zeeland, Flanders, is estimated at 1,600,000 florins. For the middle group of islands, North and South Beveland and Walcheren, which work is to be undertaken as soon as possible, the cost is estimated at 2,000,000 florins ($800,000 at normal exchange). It has been decided that it would be more practicable to erect a central station for these islands than to attempt to connect them with the power lines of North Brabant. No arrangements have been made for the electrification of the northern group of islands. The commissioners basing estimates on the gradual expansion of the lines have made the following estimates of the total cost of the project: Zeeland, Flanders, 2,300,000 florins; central group, 2,600,000 florins; northern group, 800,000 florins, making a total of 5,700,000 florins, for which 1,000,000 florins has already been subscribed.

ELECTRIFICATION OF SOUTH AFRICAN RAILWAY.—The latest reports regarding the proposals for equipping certain sections of the government railways of the Union of South Africa for electrical operation are to the effect that no bids have as yet been accepted and that it is possible that the program may not be carried through at this time to the full extent provided for. Uncertain business conditions, it is reported, may influence the government to defer this work to some extent.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

E. Sacquet, electrical engineer, 81 Rue de Maubeuge, Geumont, Nord, France, desires information as to the manufacturers of transformer-oil purifying, filtering, drying and preserving apparatus and also manufacturers of presses for baling sheet-steel waste from the punching room.

A merchant in Chile (No. 58) desires to purchase electrical goods and motors, automobile accessories, electric lamps of 110 volts and 220 volts, supplies and parts.

An agency is desired by a mercantile company in France (No. 69) for the sale of refrigerating machinery.

New Apparatus and Publications

CONSTRUCTION.—Sanderson & Porter, New York City, consulting and construction engineers, have issued a folder showing some of the properties—power plants, transmission lines, etc.—built by them.

LIGHTNING ARRESTERS. — The Hi-Voltage Equipment Company, Cleveland, has issued Bulletin No. 2, on its new flash-rod lightning arresters and choke coils and fuses.

VACUUM CLEANER. — The Electric Vacuum Cleaner Company, Inc., Euclid Avenue and Ivanhoe Road, Cleveland, has developed a small "Premier Handy" vacuum cleaner weighing 6 lb.

DOUBLE TIGHTENING VALVE. — "Tight In Two Places" is the title of pamphlet DT-1601 issued by the Yarnall-Waring Company, Chestnut Hill, Philadelphia, describing the "Yarway" double tightening valve.

MAST ARM.—The Erie Electrical Equipment Company, Inc., Johnstown, Pa., is distributing a folder describing the "Erie" mast arm.

GRAPHIC INSTRUMENTS. — "Do It Graphically" is the title of a booklet distributed by the Esterline-Angus Company, Indianapolis, covering the Esterline graphic instruments.

WIRING FITTINGS. — The Michigan Stamping Company, Detroit, has issued bulletin No. 10, covering "Michigan" wiring fittings, including a patented sectional switch box, panel surface cabinets and stamped steel fixture stud.

PIPING SYSTEM.—The M. J. Dougherty Company, Twenty-fifth and Washington Avenue, Philadelphia, piping fabricators and engineers, is distributing bulletin W-10 on modern piping practice.

TANK RHEOSTATS.—The Ward Leonard Electric Company, Mount Vernon, N. Y., is distributing a four-leaf pamphlet describing "Ward Leonard" tank rheostats.

SIGNALING HORN.—The Klaxon Company, Newark, N. J., has placed on the market an alternating-current duplex horn for sounding alarms and code, time and telephone call signals.

PUSH-BUTTON.—The Fahnestock Electric Company, East Avenue and Eighth Street, Long Island City, New York, has placed on the market a push-button equipped with spring clip terminals.

TERMINAL AND CONNECTOR. — The Battery Equipment & Supply Company, Inc., 1400 South Michigan Avenue, Chicago, has placed on the market "Uni-All" terminal, designed for storage-battery use.

PUSH-BUTTON SWITCH. — The Ward Electric Company, Inc., Philadelphia Stock Exchange Building, Philadelphia, has recently placed on the market a push-button switch, made in both single-pole and three-way types.

PANEL-MOUNTING RHEOSTAT. — A panel-mounting rheostat ("Fada") designed to control filament temperature of vacuum tubes in radio work has recently been developed by Frank A. D. Andrea, 1882 Jerome Avenue, New York City.

HEATER.—An electric bathroom heater and radiator which may be set in the wall has been developed by the William H. Jackson Company, 2 West Forty-seventh Street, New York City.

WASHING MACHINE. — An electric washing machine known as "Klean Kwick," which operates on vacuum principle, has been developed by the Du Mond Manufacturing Company, Cedar Falls, Iowa.

RANGE.—An electric range known as "Light-Wire," built for operation on the lighting circuit, has been placed on the market by the Standard Electric Stove Company, 1720 North Twelfth Street, Toledo.

New Incorporations

THE MIDDLE STATES ELECTRIC COMPANY, New York, N. Y., has been incorporated with a capital stock of $5,000 to manufacture electrical products. The incorporators are J. Mittleman, M. Eisenstadt and A. Zahn. The company is represented by Barondess & Chaitin, 27 Cedar Street.

THE SCHOOLFIELD-HARVEY ELECTRIC COMPANY, Charleston, W. Va., has been incorporated by Raymond R. and G. C. Schoolfield and Leonard P. Harvey. The company is capitalized at $10,000 and proposes to manufacture electrical supplies.

THE HOME WIRING COMPANY, 409 East Jefferson Street, Joliet, Ill., has been incorporated by Earl L. Rohm and Harry C. Norris to manufacture and deal in electrical appliances and fixtures. The company is capitalized at $35,000.

THE EXCELLIGHT COMPANY, Forestville, Conn., has been incorporated by Frederick N. Manross, Rudolph Stern, H. Geruldson, C. W. Armstrong and C. I. Johnson of New Haven, to manufacture and deal in lamp products. The new company will be a subsidiary of the Nationarl Marine Lamp Company.

THE RURAL ELECTRIC SERVICE COMPANY, Shelby, Ohio, has been incorporated with a capital of $10,000 to furnish electricity in the vicinity of Shelby. The incorporators are U. Spangler, C. J. Laser, J. W. Marriott, T. C. Hahn and R. M. Mead.

THE MECHANICAL & ELECTRICAL MANUFACTURING COMPANY, Bethel, Maine, has been chartered with a capital stock of $100,000 to manufacture electrical equipment and machine products. The officers of the company are Theodore Morin, Bethel, president and treasurer, and Ellery C. Park, secretary.

THE SCHOEZLER-ASH MANUFACTURING COMPANY, Buffalo, N. Y., has been incorporated by M. J. and L. F. Schoezler and J. H. Ash, to manufacture electric motors and kindred equipment. William J. Volker, Mutual Life Building, represents the company.

THE ROBERT BOSCH MAGNETO COMPANY, New York, N. Y., has been incorporated with a capital stock of $250,000 to manufacture and deal in engineering appliances. The incorporators are O. Heins and G. Jahn. H. T. Andrews, 115 Broadway, is attorney.

THE NASSAU ELECTRIC PLATING WORKS, Freeport, N. Y. has been chartered with a capital stock of $5,000 by H. Weber, T. E. Gaffey and E. O. Chandler. J. C. Judge, 44 Court Street, Brooklyn, is attorney.

THE S. K. RUCKMAN ELECTRIC COMPANY, 217½ South Gay Street, Knoxville, Tenn., has been incorporated with a capital stock of $10,000 by S. K. Ruckman and H. B. Angel

THE LEONARD A. SYLVIA COMPANY, New Bedford, Mass., has been incorporated with a capital stock of $15,000 to manufacture electrical machinery. The incorporators are Leonard A. Sylvia, F. W. Sylvia, and George W. Gifford, New Bedford.

Record of Electrical Patents

Notes on United States Patents

(Issued Aug. 23, 1921)

1,388,479. ELECTRICAL WATER-LEVEL-INDICATING APPARATUS; Walter D. Nickum, Glendale, Cal. App. filed Sept. 16, 1918. For giving alarm upon occurrence of low water in boilers, reservoirs, etc.

1,388,488. ELECTROVAPOR-HEATED STEERING WHEEL; Arthur L. Senn, Seattle, Wash. App. filed May 24, 1920. Heated as desired.

1,388,507. SYNCHRONIZING SYSTEM; John H. Bell, South Orange, N. J. App. filed May 1, 1920. For printing telegraph systems.

1,388,512. SECONDARY ELECTRIC CLOCK; Thaddeus S. Casner, Plainfield, N. J. App. filed April 19, 1921. Small number of moving parts.

1,388,526. HOT-AIR SYRINGE. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. App. filed Aug. 13, 1917. Employed by dentists.

1,388,527. IONIZATION-CURRENT REGULATOR; Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. App. filed Nov. 5, 1918. For use of dentists.

1,388,528. TROLLEY SHOE; Lewis H. Shipman, Boston, Mass. App. filed July 18, 1918. Sliding shoe.

1,388,530. ELECTRODE FOR STORAGE BATTERIES; Vincent C. Stanley, Brookline, Mass. App. filed Feb. 4, 1920. For comparatively small cells.

1,388,541. CIRCUIT-CONTROLLING APPARATUS; Homer C. Woodbury, Providence, R. I. App. filed Feb. 13, 1919. For use with a rotary hydrocarbon burner.

1,388,555. DYNAMO-ELECTRIC MACHINE; Herbert S. Eadesm, Philadelphia, Pa. App. filed June 29, 1920. Mutiple-rotor dynamo-electric machines.

1,388,589. HEATING-ELEMENT-CONTROLLING DEVICE; Paul M. Mueller, Erie, Pa. App. filed March 24, 1920. Automatic switch prevents overheating.

1,388,590. TROLLEY WHEEL FOR ELECTRIC STREET CARS; Julio S. Navarro, Havana, Cuba. App. filed March 21, 1921. Made in separate halves (in disk form).

1,388,613. PROCESS OF AUTOMATICALLY REGULATING THE ADDITION OF A TREATING AGENT TO WATER; Julian S. Simsohn, Philadelphia, Pa. App. filed Oct. 25, 1918. Treatment of water, sewage, etc.

1,388,645. ELECTRIC LAMP SOCKET; David Hjorth, Bridgeport, Conn. App. filed March 27, 1919. Two-part socket including shell and cap.

1,388,656. STORAGE BATTERY; Lamar Lyndon, West Orange, N. J. App. filed April 30, 1919. Improved mounting for electrode plates.

1,388,703. RECEIVER-HOOK SWITCH; John T. Gray, Great Falls, Mont. App. filed Aug. 13, 1919. Maximum opening movement transmitted to contact members.

1,388,719. ELECTRIC IRON; James W. Johnston, Salt Lake City, Utah. App. filed April 5, 1920. Means for holding electric cord tight.

1,388,720. TELEPHONE ATTACHMENT; Charles E. Jones, New York, N. Y. App. filed May 17, 1920. Shutter operable to cover or uncover opening in mouthpiece.

1,388,727. BATTERY TESTER; Lewis L. Laska, Cordova, Alaska. App. filed Aug. 9, 1919. For testing flashlight batteries.

1,388,754. PROCESS FOR THE MANUFACTURE OF METALLIC DIAPHRAGMS OF ELECTROLYTIC CELLS; Rodolphe Pechkranz, Carouge-Geneva, Switzerland. App. filed June 1, 1920. Thin, porous diaphragm.

1,388,759. ELECTRIC FOLDING AND CURLING IRON; Gaetano Rapizzi, Parabiago, Italy. App. filed Sept. 15, 1920. To fold and curl hairs, stuffs, etc.

1,388,793. VACUUM-TYPE CONVERTER; Wilfred T. Birdsall, Montclair, N. J. App. filed Jan. 5, 1917. Operates with stability and efficiency.

1,388,805. CURLING IRON; Thomas L. Dennis, New York, N. Y. App. filed Aug. 18, 1920. Heating element does not interfere with movable parts.

1,388,822. CIRCULATOR HEATER; Herman E. Roys, New York, N. Y. App. filed Nov. 15, 1919. For attachment to an electric fan.

1,388,834. SPARK-GAP APPARATUS; Fritz Lowenstein, Brooklyn, N. Y. App. filed Jan. 19, 1918. Quenched spark gap for radio transmitter.

(Issued Aug. 30, 1921)

1,388,850. STORAGE BATTERY; Thomas R. Cook, Pittsburgh, Pa. App. filed July 21, 1920. Employed in portable electric flashlamps.

1,388,858. TIME-CONTROLLED MECHANISM; William H. Greenleaf, Hartford, Conn. App. filed March 29, 1920. Self-winding timepiece.

1,388,874. FORMING DIELECTRIC FILMS; Ralph D. Mershon, New York, N. Y. App. filed Feb. 18, 1920. For condensers, rectifiers and other devices.

1,388,887. INDICATING SYSTEM; Lipa Polinkowsky, Antwerp, Belgium. App. filed Nov. 1, 1919. For visually indicating to operators the lines with which connections are desired.

1,388,906. ELECTRIC MOTOR-CONTROL SYSTEM; Harry A. Wackerly, Alliance, Ohio. App. filed July 21, 1920. For automatically controlling the limit of travel of machinery.

1,388,936. RADIO TELEGRAPHIC AND TELEPHONIC APPARATUS; Horace St. John de Aula Donisthorpe, London, England. App. filed April 28, 1920. Portable receiving sets.

1,388,948. HAND LAMP; Carl Hambuechen, Belleville, Ill. App. filed April 27, 1917. Conducting strip placed outside of battery chamber.

1,388,949. AUDIO-FREQUENCY WIRELESS FOG-SIGNAL SYSTEM; E. C. Hanson, Los Angeles, Cal. App. filed June 4, 1918. For indicating to navigator position of ship.

1,388,963. SOUND-TRANSMITTING INSTRUMENT; Alexander Marr, Biggin Hill, England. App. filed May 27, 1919. Microphonic instrument in which vibration of a diaphragm alters resistance of a cell.

1,388,966. ELECTRIC HEATING AND REGULATING DEVICE FOR INCUBATORS; William G. Nelson, Racine, Wis. App. filed Jan. 15, 1920. Means to open and close circuit automatically.

1,388,974. ELECTRIC HEATER FOR POULTRY PLANTS; John P. Schreiner, Mount Vernon, N. Y. App. filed July 10, 1920. Utilizes ordinary incandescent bulb for heating purposes.

1,388,990. DRY CELL; H. de Olaneta, New Haven, Conn. App. filed May 7, 1920. Deleterious gases harmlessly disposed of.

1,389,018. GRID FOR STORAGE BATTERIES; John C. Sundby, Enderlin, N. D. App. filed Sept. 7, 1920. Constructed to prevent undue buckling.

1,389,026. RADIO RECEIVING SYSTEM; Vannevar Bush, Chelsea, Mass. App. filed May 19, 1920. For transforming sustained oscillations into groups at audible frequency.

1,389,032. ELECTRIC IRON; Ralph C. Curth, Columbus, Ohio. App. filed Feb. 10, 1920. Switch mounted in handle.

1,389,051. CONTINUOUS-CURRENT DYNAMO; Fritz Kesselring, Neuhausen, Switzerland. App. filed June 12, 1920. Approximately constant voltage obtained at variable speed.

1,389,061. SIGNAL SYSTEM; Daniel J. McCarthy, Elgin, Ill. App. filed June 28, 1920. Railway signal lights.

1,389,080. SYSTEM OF MOTOR CONTROL; Leigh J. Stephenson, Chicago, Ill. App. filed Nov. 28, 1919. For controlling plurality of motors connected to drive same mechanism.

1,389,105. CONTROL APPARATUS; Karl A. Simmon, Edgewood Park, Pa. App. filed Dec. 13, 1919. Manually operated, rotative-type controllers.

1,389,110. DYNAMO-ELECTRIC MACHINE; Charles E. Wilson, Wilkinsburg, Pa. App. filed March 9, 1917. Regenerative operation of electric railway vehicle motors.

1,389,112. INCANDESCENT-LAMP LOCK; Samuel L. Adelson, New York, N. Y. App. filed March 25, 1920. Inexpensive socket from which bulb cannot be removed.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CAMBRIDGE, MASS. — A. F. Robinson contemplates the construction of a two-story addition, 95 ft. x 105 ft., to the power house at his plant at Binney and Second Streets. The cost is estimated at $75,000.

DEXTER, MASS.—The city authorities contemplate the erection of a transmission line from Dexter to Winfield, to cost about $24,000.

Middle Atlantic States

BRADFORD, N. Y.—The construction of a municipal electric plant in Bradford is under consideration by the City Council.

HAMILTON, N. Y.—The Madison Power Company has been granted permission by the Public Service Commission to erect and operate a transmission line in Easton Street, and to furnish electricity for light and power under a franchise granted by the village authorities.

NEW YORK, N. Y.—Plans have been prepared by the Rice Foundation Company, 12 East Eighty-seventh Street, in co-operation with the city authorities, for the construction of a one-story power house, 73 ft. x 73 ft., at Pelham Bay Park.

PATTERSON, N. Y.—The Carmel (N. Y.) Light & Power Company has applied to the Public Service Commission for authority to construct an addition to its electric power plant at Patterson. Extensions, it is understood, will also be made to the distributing lines for local service.

STAPLETON, S. I., N. Y.—Bids will be received by M. Hulbert, Commissioner of Docks, foot of Battery Place, North River, New York City, until Oct. 4, for furnishing and installing cranes, elevators and electric power transmission equipment at piers 12 and 13, Stapleton, S. I. The work includes new boiler plants.

SYRACUSE, N. Y.—The Syracuse Lighting Company, a subsidiary of the United Gas Improvement Company, has filed notice of increase in its capital stock from $4,000,000 to $5,000,000.

ESSEX FELLS, N. J. — Bonds to the amount of $30,000 have been authorized by the Borough Council, the proceeds to be used for improvements to the municipal waterworks, including the installation of electrically operated pumping machinery.

BERWICK, PA. — The pumping station, including four large pumps, electrical motors and other equipment, of the Berwick Water Company was recently destroyed by fire. The loss is estimated at about $100,000.

CLIFTON HEIGHTS, PA.—The construction of a power house, 25 ft. x 52 ft., in connection with other extensions at the Clifton Yarn Mills, is under consideration.

DOYLESTOWN, PA.—The Bucks County Public Service Company is contemplating extensions of its service lines to Mechanics Valley, Buckingham, Lanhasha and Holicog for local distribution of electricity for lamps and motors. Extension of its transmission lines to New Hope and Aquetong are also under consideration.

PEQUEA, PA. — The Pequea Electric Company, recently organized by John H. Myers and others, has purchased from the Farmers' Electric Company, Lancaster, the entire lighting system south of Marticville. The new owners are planning to rebuild and extend the lines.

PHILADELPHIA, PA.—S. W. Evans & Son, manufacturers of metal products, 4623 Paul Street, contemplate the construction of a one-story power house in connection with a proposed addition to their plant, to cost about $125,000.

PITTSBURGH, PA.—Enlargement of the cold-storage and refrigerating plant of the Tech Food Products Company, Thirty-sixth and Butler Streets, is under consideration. Three electrically operated ice machines

will be installed, with auxiliary power equipment.

WILKES-BARRE, PA.—Negotiations are under way between the Wilkes-Barre Company and the Pennsylvania Power & Light Company to supply the city of Wilkes-Barre with electricity on a contract basis. This arrangement, should the proposition be accepted, will include the erection of a high-tension transmission line by the Pennsylvania Power & Light Company from its nearest power station into Wyoming Valley. Iron towers would be used to support the cables. The cost of the line would involve an expenditure of approximately $750,000. E. A. Wakeman is general manager of the Wilkes-Barre Company.

CATONSVILLE, MD.—The construction of a power plant at the St. Charles' College at Catonsville near Maryland, in connection with other buildings, is under consideration by the board of directors of the institution. The cost is estimated at $180,000.

GRAHAM, VA.—The Princeton Power Company has filed notice of an increase in capital stock from $100,000 to $200,000.

HARRISONBURG, VA.—Plans are under consideration by the finance committee of the City Council and a committee of ten to ascertain the feasibility of completing the power plant near Grove Hill on the Shenandoah River, to furnish additional electric power to Harrisonburg.

NORFOLK, VA.—Plans are under way by the Anheuser-Busch Company for an addition to its local ice and cold-storage plant, to cost, with equipment, about $250,000. Ophuls, Hill & McCreery, Inc., 112 West Forty-second Street, New York City, are engineers.

North Central States

GALION, OHIO.—The James H. Heron Company, engineer, in its report to the City Council recommends the removal of the municipal electric plant to a new location and a combination, if possible, with the waterworks pumping station. The maximum cost of the proposed plant is placed at $132,000.

TOLEDO, OHIO.—Bids will be received by C. A. Benedict, Director of Public Service, Toledo, Ohio, until Oct. 4, for the construction of a sewage pumping station and the installation of equipment including five centrifugal pumps with 300-hp. and 200-hp. motors, vacuum pumps, piping, valves, meters and gages for the pumps, electric crane, sewage screens and hoists, switchboard and electrical equipment. Plans and specifications may be obtained from the office of the Director of Public Service, 225 Valentine Building, Toledo, and from Fuller & McClintock, engineers, 170 Broadway, New York City.

LOUISVILLE, KY.—Arrangements have been made by the Louisville Gas & Electric Company for the installation of new lamp standards on Fifth Street between Green and Walnut Streets, to cost about $20,000.

FORT WAYNE, IND.—Work will be started at once by the Indiana Public Service Company on the construction of a power house at 301 Militia Street.

HARTFORD CITY, IND.—The Board of Blackford County Commissioners is planning to install an electric lighting system in the county infirmary.

INDIANAPOLIS, IND.—Plans are under way by the Board of County Commissioners for extensions and improvements to the local power plant used for county institutions.

ATLANTA, ILL.—The Atlanta Electric Light Company contemplates the erection of a transmission line, a distance of 13 miles, to connect Lincoln with Atlanta. Energy will be purchased from the Lincoln Water & Light Company.

JOLIET, ILL.—Bids will be received by Zimmerman, Saxe & Zimmerman, 64 East Van Buren Street, Chicago, for a one-story power house, 70 ft. x 80 ft., to cost $45,000, at the Illinois Penitentiary, Joliet.

SHERRARD, ILL.—The Sherrard Electric Company is considering the erection of a transmission line to furnish electricity in the town of Reynolds and adjacent territory.

VERGAS, MINN.—Bonds have been voted for the erection of a high-tension transmission line from Vergas to connect with the line of the Otter Tail Power Company at Frazee.

MAQUOKETA, IOWA.—The Iowa Electric Light Company is having plans prepared for the construction of a hydro-electric plant at Maquoketa, to cost about $75,000. Holland, Akerman & Holland, 106 Liberty Street, Ann Arbor, Mich., are engineers.

LA MOURE, N. D.—The Dakota Utilities Company contemplates the erection of a transmission line from La Moure to Verona.

HECLA, S. D.—Plans have been prepared for the construction of a new municipal electric power house, W. H. Higby is city clerk.

MAGNET, NEB.—The village authorities are contemplating the sale of the municipal electric light system and connecting up with the line of the Tri-State Utilities Company. The cost of the improvement is estimated at $12,000.

HAYS, KAN.—Improvements to the municipal electric light plant, to cost about $19,000, are under consideration .

McCRACKEN, KAN.—The City Council is considering calling an election to submit to the voters the proposal to issue bonds for the construction of a municipal electric plant.

Southern States

MARION, S. C.—The City Council is considering the installation of an electric lighting system in Marion.

GAINESVILLE, FLA.—Plans are under consideration by the Council for extensions and improvements to the municipal electric power plant, to cost about $30,000.

JACKSONVILLE, FLA.—The Tidewater Glass Company is planning the construction of a new plant to comprise two manufacturing units, to cost about $150,000 each. The installation will include mold shop, power house and other departments. C. H. Dankworth and F. W. Stewart are interested in the company.

ABBEVILLE, LA.—Bonds to the amount of $125,000 have been voted for rebuilding the municipal electric system, including overhead lines, improvements to the street-lighting system, installing internal-combustion engines, etc. Henry A. Mentz, Magnolia, Miss., is consulting engineer.

CROWLEY, LA.—Bids will be received by the city of Crowley, Louisiana, at the office of J. O. Herin, city manager, until Oct. 17, for power-plant equipment f.o.b. as follows: (1) One crude-oil engine, between 350 b. hp. and 400 b. hp. standard rating, complete with all accessories, including exhaust muffler, outboard bearing and extension shaft to carry direct-connected alternator and exciter. (2) One three-phase, 60-cycle, 2,300-volt oil-engine type alternator of capacity and speed to suit selected engine, without base, shaft or bearings, but with dampening winding, generator rheostat, discharge resistance foundation bolts, sole plates and pressing rotor on extension shaft. (3) One engine-type exciter of capacity and speed to suit selected engine and alternator, without base shaft or bearings, but with rheostat, foundation bolts, sole plates and pressing armature on extension shaft. (4) One switchboard as per specifications on file in the office of the city manager at Crowley. Bidders will submit their own specifications, guarantees, etc.

LAHOMA, OKLA.—The City Council is considering the installation of a lighting system in Lahoma.

MANCHESTER, OKLA.—The erection of a transmission line from Manchester, Okla. to Anthony, Kan., to cost $27,000, is under consideration. W. B. Rollins, Railway Exchange Building, Kansas City, Mo., is engineer.

WOODWARD, OKLA.—Improvements to the municipal electric light plant are under consideration by the City Council.

WAXAHACHIE, TEX.—Work will be started at once by the Texas Oil Products Company on the construction of an oil refinery, to cost about $750,000. The present plans provide for a power house, installation of electrical machinery, etc.

Pacific and Mountain States

PUGET SOUND, WASH.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 27 for two dynamo condenser, condensate, centrifugal turbine-driven pumps, with miscellaneous spare parts, at the Puget Sound Navy Yard.

COTTAGE GROVE, ORE.—Bonds to the amount of $50,000 have been voted to establish a municipal electric light system in Cottage Grove.

LOS ANGELES, CAL.—The Southern California Edison Company has been authorized by the Railroad Commission to proceed with the construction of an additional unit at its Big Creek hydro-electric development.

MARE ISLAND, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C. for the following: Until Oct. 4, Mare Island, Schedule 8,753—2,000 ft. telephone cable; Schedule 8,754—miscellaneous insulating fiber, 12,200 fuse elements, 6,000 flanged-heel globes, 500 receptacles, 200 lb. hard sheet rubber, 4,500 cable terminals and six voltmeters.

POMONA, CAL.—The City Council is considering the installation of an ornamental lighting system on Randolph Street between Park and Wisconsin Streets.

REDONDO, CAL.—The installation of ornamental lamps on the business streets in Redondo is under consideration.

SAN FRANCISCO, CAL.—The Pacific Gas Electric Company is considering the installation of new switching equipment at the Artois substation, north of Willows, and increasing the capacity of that station from 15,000 kw. to 45,000 kw., to cost about $30,000. The company also contemplates the construction of a substation at Wilkins Slough between Knight's Landing and Coulsa, etc., to cost $45,000.

SONOMA, CAL.—The Sonoma Valley Water, Light & Power Company has been granted conditional permission by the Railroad Commission to issue $100,000 in bonds, the proceeds to be used for the acquisition of the property of the Sonoma City Water Works and the Sonoma Vista Water Company, also for extensions, improvements and to pay indebtedness.

BOISE, IDAHO.—A site on the Payette River has been purchased by the Dead Ox Flat Irrigation District for the establishment of a power plant.

FRANKLIN, IDAHO.—The Utah Power & Light Company, Salt Lake City, Utah, is considering the construction of another large dam.

PHOENIX, ARIZ.—The Garrick & Mangham Agua Fria Lands & Irrigation Company has made arrangements with the Shattuck Construction Company, San Francisco, to take over all the construction work in connection with the development of an irrigation project in the district west of Phoenix, to cost approximately $1,800,000. The present plans provide for pumping plants, siphons across the Agua Fria, transmission lines, canals, etc. The work is to start not later than March 1, 1922.

NEVADA CITY, NEV.—The Delhi Power Company is having plans prepared for the construction of a power house, penstock and transmission line. A. A. Codd is engineer.

Canada

WINNIPEG, MAN.—Announcement has been made by A. W. McLimont, vice-president of the Winnipeg Electric Railway Company, that arrangements have been completed for financing a 168,000-hp. hydro-electric development at Great Falls on the Winnipeg River, 63 miles from Winnipeg, to cost $10,000,000. Work is already under way on the project, which will be carried out under the charter of the Manitoba Power Company. The latter company is taking over the plant and assets of the Winnipeg River Power Company, Ltd.

DRESDEN, ONT.—The authorities of Camden Township are planning the erection of a hydro-electric system. E. R. Fowler, 190 University Avenue, Toronto, is the engineer.

PAISLEY, ONT.—A by-law appropriating $24,700 has been passed for the installation of hydro-electric service in Paisley. Electricity will be furnished from the Eugenia Falls system, a distance of 11 miles.

THEDFORD, ONT.—A by-law has been authorized providing for $16,500 for hydro-electric service in Thedford.

COTEAU DU LAC, QUE.—Bids will be received by Joseph Langevin until Sept. 30 for the construction of electric light and power plants to cost $30,000.

MONTREAL, QUE.—Reports submitted by the Administrative Commission appropriating $15,000 for replacing the boilers at the Craig Street pumping station and $11,000 for renewing pumps at the Rielee Street pumping station will be again considered by the City Council.